

Dimensions
of Quality

Acceptability

Accessibility

Appropriateness

Effectiveness

Efficiency

Safety



2009 Measuring & Monitoring for Success

Areas
of Need

Being Healthy

Getting Better

Living with
Illness or
Disability

End of Life

The core mandate of the Health Quality Council of Alberta is to measure, monitor and assess the quality and safety of health care services in Alberta and to support improvement through collaboration with service-providing organizations, health professionals and Alberta Health and Wellness.

The Council's monitoring role requires it to systematically measure selected aspects of health care conditions, services, programs, projects or initiatives to track changes and progress in the achievement of improved quality and safety. This involves highlighting successes and areas for improvement as well as providing relevant recommendations.

To measure quality and safety, the Council uses tools such as surveys, focus groups, analysis of administrative and operational data, evaluations and inquiries.

Table of Contents

Foreword	3
Introduction	5
1.0 System-level Indicators	7
Overview	7
Health Care Expenditure Indicators	8
1.1 Inflation Adjusted Public Health Expenditure	8
1.2 Inflation Adjusted Public Health Expenditure Per Age-weighted Capita	10
Health Care Utilization Indicators by Health Status Using Clinical Risk Groups	12
1.3 Proportion of Population Growth by Clinical Risk Group and Proportion of Total Direct Cost by Clinical Risk Group	12
1.4 Average Prospective Per Person Utilization by Clinical Risk Group	14
1.5 Average Prospective Per Person Direct Costs	14
1.6 Alberta Average Utilization for Selected Diabetes Clinical Risk Groups	15
1.7 Transition Rate from Confirmed Diabetes Alone to Diabetes with Other Chronic Diseases	16
Patient Experience Indicators	17
1.8 Overall Rating of Satisfaction with Health Care Services	17
1.9 Overall Rating of Access to Health Care Services	18
1.10 Self-reported Experience with Unexpected Harm while Receiving Health Care Services	19
2.0 Clinical-level Indicators	21
Overview	21
Clinical Indicator Development Facilitates Timely System-wide Application	22
Health Quality Dimension: Acceptability	22
2.1 Alberta Emergency Departments: Overall satisfaction and rating of care for patients attending Alberta emergency departments	22
Health Quality Dimension: Accessibility	25
2.2 Acute Care Access from the Community: Median wait time to receive selected elective surgeries from the first available surgeon	25
2.3 Acute Care Access from Emergency Departments: Median length of time from emergency department arrival to admission for selected life-threatening conditions	30

Health Quality Dimension: Appropriateness	.34
2.4 Emergency Departments: Proportion of patients who used emergency department/urgent care services for conditions that could be managed at family physician offices	.34
2.5 Health Service Utilization: Proportion of seniors with high levels of service utilization for conditions that could be managed in the community	.39
Health Quality Dimension: Efficiency	.43
2.6 Technology Evaluation: Proportion of high-cost health technologies evaluated by cost-effectiveness analysis	.43
Health Quality Dimension: Effectiveness	.46
2.7 Acute Care for AMI: Proportion of patients who died from heart attack within 30 days of hospitalization	.46
2.8 Primary Care for Chronic Disease: Proportion of persons with coronary artery disease and diabetes that receive treatment services in primary care according to chronic disease management guidelines	.49
2.9 Long Term Care: Proportion of long term care facilities using the interRAI Long Term Care Facility Resident Assessment Instrument for resident assessment and care planning	.52
2.10 Cancer Screening: Proportion of adults aged 50 to 74, not at high risk, screened for colorectal cancer by fecal occult blood test in the last two years	.55
2.11 Perinatal Care: Incidence of stillbirths and deaths in the first seven days of life among babies born with a birth weight between 1,000 and 2,499 grams	.58
Health Quality Dimension: Safety	.61
2.12 Intensive Care Units: Proportion of ventilator-assisted patients in intensive care units in compliance with the ventilator-associated pneumonia care bundle	.61
2.13 Surgical Procedures: Proportion of patients receiving appropriate prophylactic antibiotics prior to surgery	.64
2.14 Prevention of Antibiotic-resistant Organisms: Incidence of health care associated infections by Methicillin Resistant Staphylococcus Aureus (MRSA)	.67
3.0 Achieving a Balance	.71
Acknowledgements	.74
List of Figures	.75
List of Tables	.76
Glossary	.77
References	.79

Foreword

In a \$13-billion per year health care system, measuring for quality supports sustainability.



On behalf of the Health Quality Council of Alberta (HQCA), I am pleased to introduce *Measuring & Monitoring for Success*, our first report that looks at quality measurement in Alberta's health care system. The impetus for the report comes from a growing global movement towards measurement in health care. It is based on the recognition that measurement is integral to determining if a system, organization or individual is delivering quality health care and that existing data often says little about the quality of health care received for the dollars spent.

The HQCA is mandated to measure, monitor and assess the quality and safety of Alberta's health care system. Our monitoring role requires us to systematically measure selected aspects of health care conditions, services, programs, projects or initiatives to track changes and progress in achieving improved quality and safety. This includes determining areas where we are doing well and areas that need improvement.

Albertans deserve to have better information on where their health care dollars go, and the value they get for them. Putting a system in place to do this is a complex task. It means establishing the necessary measures to track detailed costs at the patient level as well as the quality of care and outcomes obtained for those costs. It means ensuring we have the optimal information resources and systems in place to support data collection and reporting of quality-focused measures. And it means we have a culture in place that encourages and enables people to act on that information to improve quality of care throughout the province.

In a \$13-billion per year health care system, measuring for quality supports sustainability. We believe that if the quality and safety agendas are firmly embedded in health service organizations, and if we continuously measure and report on quality improvement, efficiency will improve, results will be sustained and individuals will have a safer and more effective health encounter.

In this report, we look at quality measurement from the perspective of the health system, which tends to be fuelled by existing administrative data. We also look at it from the perspective of quality improvement, which is fuelled by primary data collection and driven by innovation and the interest of providers to improve. Highlighted in the report are examples of success in Alberta's health care system – pockets where measurement occurs and improvements in quality happen as a result.

Developing this report would not have been possible without the collaborative effort of many others. We thank Alberta Health and Wellness and Alberta Health Services for their support. We also thank the many people throughout the province who provided clinical and program expertise to this project. Their enthusiasm and commitment to quality measurement and improvement highlights what is possible on this exciting new path.

Throughout the world, there is a growing movement to measure quality in health care. Alberta is no different. We believe this report is an important step towards developing an overall quality improvement strategy in our province that defines what measures are important and how these measures can be established and supported.



John W. Cowell, MD
Chief Executive Officer
June 2009

Introduction

The health care system is an enormous industry of great importance to Albertans. The province currently spends over \$13 billion of its \$35 billion budget on public health care.¹ Increases in health care spending over the last 20 years have generated concerns about sustainability and the value gained for this public expenditure.

Today, high-level health care activity such as physician visits, hospitalizations and budgets can be accounted for based on available data. However, the details of individual patient encounters with the health system are often not captured and it is difficult to break down health care expenditures to the patient level.

Generally, the costs of caring for a specific patient fall within a multitude of separate budgets and payment streams. While this may be sufficient or even desirable for budget and public payment purposes, it is not sufficient for determining the relative cost-effectiveness and efficiency of care, which requires costs to be attributed at the patient level.

More important, existing data can say little about the quality of health care received for the dollars spent.

Today the system relies primarily on the professional competence and training of health care providers to ensure patients receive high quality health care services that result in the desired health outcomes.

Benefits of Systematically Measuring Quality and Outcomes

Systematic measurement of health care quality and health outcomes is increasingly recognized to be important, and successful examples are the focus of this report's second section. At the front line, such measurement can help providers improve the care they give their patients. At a clinical and program level, this information is critical to the evaluation of innovations in health care delivery and performance. At a system level, measurement of health care quality and health outcomes is essential to determining what value is received for public expenditure on services.

Measurement can answer questions such as: Does a new chronic disease management program deliver better quality care? Does establishing a primary care network provide greater access and continuity of care? Which technology is the most cost effective? Which care delivery models provide the best quality for the cost? Which is the most efficient program or care delivery model? What is the relative value of investing in alternative models or processes of care in terms of health care quality and health outcome? Which areas could be improved?

Better Information Resources Needed

Albertans deserve to have more comprehensive, comparable and actionable information about their health care system. Better information resources are needed to optimize the management of health care services in Alberta. The necessary measures need to be established to track patient-level costs in more detail on one side of the equation, and the quality of care and outcomes obtained for those expenditures on the other.

Why Did the HQCA Write *Measuring & Monitoring for Success*?

The health care sector is extremely complex with a multitude of services, locations, care providers, professionals, processes, procedures, treatments and technologies, as well as variable and changing evidence for best practice. These must all come together effectively *with the patient at the centre* to achieve the best possible outcomes in the most efficient way.

Health care is in the midst of a shift that expands the responsibility for quality from professional competency alone towards professional competency

supported by evidence-based practice, systems thinking, measurement and continuous quality improvement. This transition and the associated challenges are not unique to Alberta. They are being faced by health systems around the world.²

In this report, the HQCA has focused on health care quality indicators from two perspectives: the health system, fuelled by existing administrative data and driven by concerns for performance; and the clinical-level perspective, fuelled by primary data collection and driven by innovation and the interest of providers to improve. In reality, these perspectives are converging and need to converge.

Data systems and measurement activities are moving towards greater integration. Although some of the information needed is available now, it tends to be contained within many separate data systems. Such information should ultimately be integrated for the purpose of better care, quality monitoring and quality improvement.

This first annual *Measuring & Monitoring for Success* provides a snapshot of where measurement stands today in Alberta. A measurement infrastructure must be developed that will define what common measures are important, and how these measures can be established and supported to link inputs to processes and outcomes. The report showcases examples of the power of measurement and how it can be used successfully to inform both system-level and front-line improvements.

To assess and maximize the value of Alberta's health care expenditure while improving the quality of care Albertans receive is a daunting task. The HQCA offers this report as a beginning step on this important and evolving journey.

Who Is the Intended Audience?

Measuring & Monitoring for Success offers information useful for health care governance, administration, professionals and policy-makers seeking to further their efforts to improve the quality and safety of Alberta's health care system.

What This Report Contains

The report is laid out in three sections:

Section 1.0: System-level Indicators provides economic indicators of the health system, new methods of presenting health care utilization indicators by health status, overall ratings of satisfaction with and access to health care services, and self-reported experience with unexpected harm while receiving health care services.

Section 2.0: Clinical-level Indicators presents sentinel outcome and process indicators related to front-line quality improvement initiatives based on the six dimensions of quality identified in the *Alberta Quality Matrix for Health*.³ These dimensions are acceptability, accessibility, appropriateness, effectiveness, efficiency and safety. This section shows that innovations are already underway in pockets of excellence in Alberta or elsewhere. They also illustrate the critical importance of measurement in guiding, evaluating and spreading innovation and quality improvement in health care. In each section, linkages between clinical-level and system-level indicators are highlighted.ⁱ

Section 3.0: Achieving a Balance offers conclusions about the current status of health care measurement in Alberta and possible directions for the future.

ⁱ The technical specifications for all the measures presented in this report are available upon request.

1.0 System-level Indicators



Overview

System-level indicators are high-level measures that are meant to reflect the overall quality of the health care system. These measures enable organizations to evaluate their health systems' overall performance on core dimensions of quality and value. They are frequently used on organizational dashboards or balanced scorecards to show performance over time or in comparison to other similar organizations and as inputs to strategic quality improvement initiatives.⁴

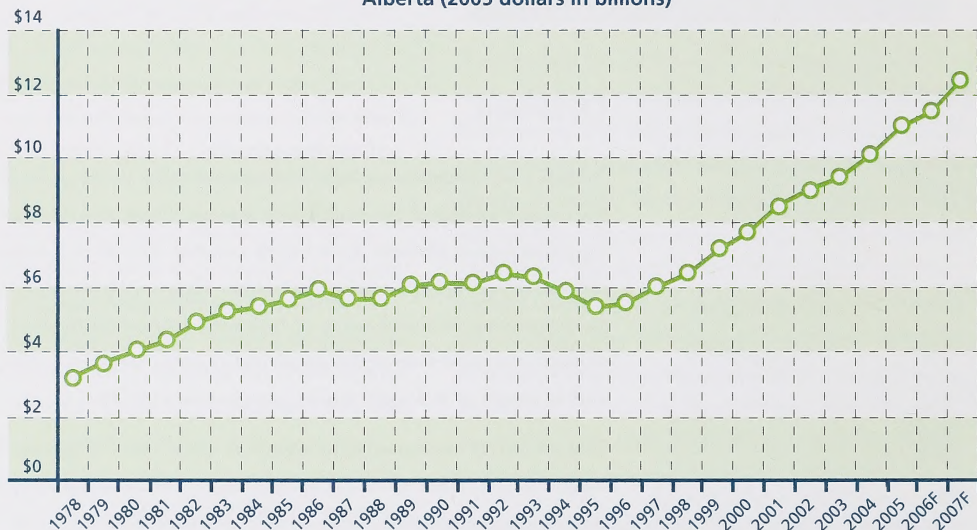
This section is not intended to reflect an entire suite of system-level measures but rather to reflect certain aspects of system-level quality. Specifically these include: high-level economic indicators; health care utilization by specific chronic conditions; overall satisfaction with and access to the health care system; and, experience with unexpected harm when receiving health care services.

Health Care Expenditure Indicators

1.1 Inflation Adjusted Public Health Expenditure

Adjusted for inflation or in real terms, Alberta's public expenditure on health increased from \$3.2 billion in 1978 to \$11.1 billion in 2005, and was forecast to be \$12.5 billion in 2007 (Figure 1). The average annual increase in health spending was \$233 million between 1978 and 1992, and \$586 million between 1995 and 2007. In other words, incremental annual spending has increased by a factor of 2.5 in the last 12 years as compared with the first 14. The overall average incremental spending during the entire period was dampened by deficit elimination efforts between 1992 and 1995.

Figure 1. Inflation adjusted public health expenditures in Alberta (2005 dollars in billions)



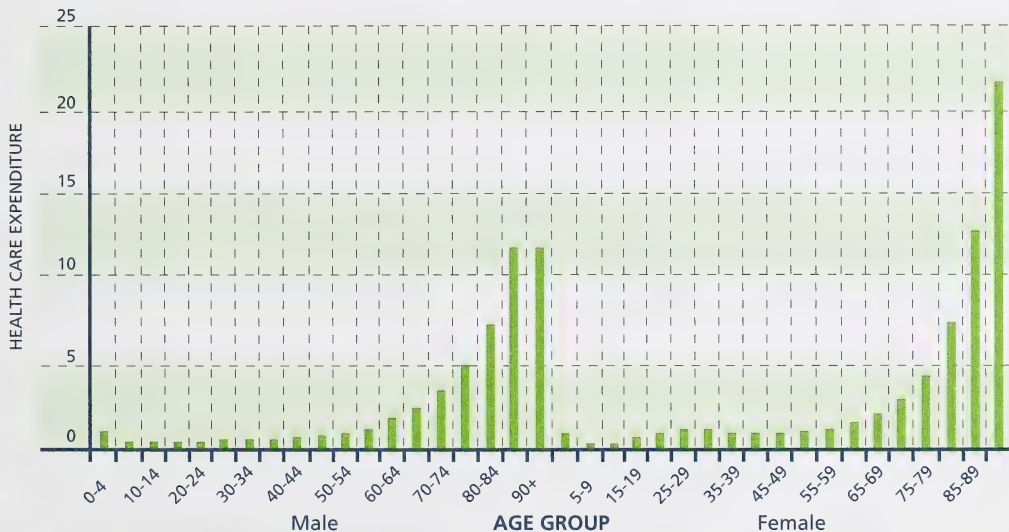
Source: Canadian Institute for Health Information, National Expenditures on Health

As spending has increased, so has the size and age of Alberta's population. Since 1978, the population has increased by 1.45 million or an average of 50,000 individuals per year, while the proportion of people over age 65 has grown from 7.8% in 1978 to 10.4% in 2007 (Statistics Canada). A growing and aging population increases the demand for health services, and these changes should be taken into account when examining contributing factors to expenditures over time.

To capture the effects of an aging population, the following curve is used to express expected relative utilization by age and gender (Figure 2). This curve is constructed by comparing average health care expenditure per person by age and gender using a set relative value for the expenditure of the average Albertan. Expenditures include doctors, hospitals, laboratory services, home care and continuing care.

For example, with the average expenditure per person valued at 1.00, the curve shows that a male aged 90+ consumes 16.4 times more health care resources than the average Albertan, while a male aged 30 to 34 consumes .5 or half as much as the average Albertan.

Figure 2. Age-weighting curve for Alberta
(Average health care expenditure per Albertan =1)



Source: Alberta Health Services; Health Systems Analysis Unit (Calgary)

If the age-weighted population is standardized to 2005 (where the actual population equals the age-weighted population), on average the age-weighted population grew by 65,800 per year as compared with the actual growth of 50,000. This represents the growth in demand for health care services due to both increased population and aging.

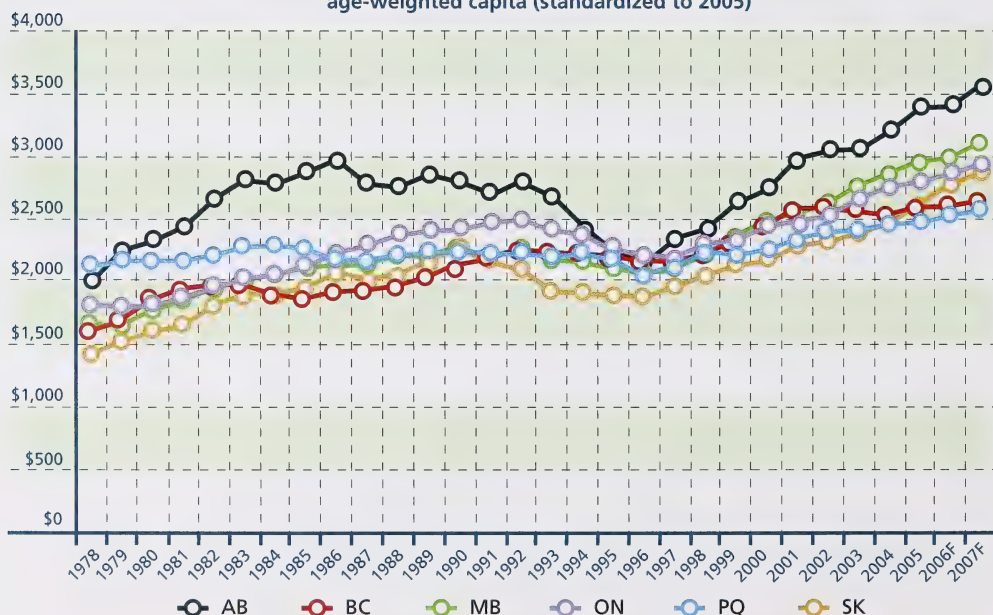
1.2 Inflation Adjusted Public Health Expenditure Per Age-weighted Capita

Figure 3 shows how expenditure on health for the average Albertan has changed, after adjusting for differences in age, population size and inflation. Real per capita expenditure on health (2005 dollars) was \$3,000 in 1986, dropping to a low of \$2,195 in 1996, back up to \$3,000 in 2001 then rising to an estimated \$3,556 in 2007.

Until 1986, expenditures on health grew faster than the compounded effects of general inflation, population growth and aging. Between 1985 and 1992, public expenditure on health increased in line with these factors. Significant decreases in real expenditure per age-weighted capita occurred during the deficit elimination period, followed by a steady trend of expenditure increases exceeding population growth, aging and general inflation since 1996.

Alberta has consistently spent more public dollars per person on health care than other provincial counterparts except for a brief period during 1995 when spending was comparable. However, it is not known if more value is being received for that increased expenditure.

Figure 3. Provincial inflation adjusted public health expenditure per age-weighted capita (standardized to 2005)



Data source: Canadian Institute for Health Information, National Expenditures on Health, Statistics Canada
Analysis: Health Quality Council of Alberta

Discussion

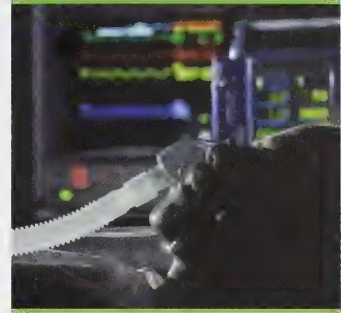
Health care costs continue to rise even after adjustments for a growing and aging population, and general inflation. The conclusion is that other unknown factors are responsible for increased health care costs, which raises the following questions:

- What accounts for the increases in cost above inflation, population growth and aging? Is the basket and cost of insured services, treatments or technologies growing?
- What accounts for the difference in spending between Alberta and other provinces? Is the availability or number of health care services received by Albertans growing relative to other provinces? Are there differences in compensation for health care professionals?
- Does Alberta get superior quality or outcomes for its greater expenditure?

These questions cannot be answered in a valid manner without better information. On the cost side of the equation, such information requires attribution of full costs at the patient level, resulting from greater standardization of functional centre costing and more detailed activity-based costing overall. On the value side, quality of care and health outcomes need to be measured (the focus of Section 2.0). Information for both sides of the equation must be granular enough to look at specific care for unique populations of patients at least on a periodic basis. It must also be possible to slice this information in different ways to evaluate different programs and care delivery systems. Such granular information can ultimately be rolled up to a higher aggregate level to assess health system performance.

It is common in health care organizations to use demographic information as a proxy for determining needs for health care services. This approach is used largely because data is readily available and the methods are straightforward. However, such analyses produce little actionable information and often raise more questions than they answer because they are done at such a high level. A constant message heard is that the problem in health care is a growing and aging population; however, it is not realistic to expect that population growth and aging can be managed.

A more useful and actionable approach involves looking at the health issues of similar individuals. Such populations can run the gamut from healthy groups of people to those who are chronically ill. For example, diabetics have a set of treatment needs and research has produced a set of best practices that health care providers should use to treat diabetes. For these patients, quality of care is defined both by their disease and how



Linking System and Clinical Indicators

New high-cost technologies can have a significant impact on overall health system expenditures. Rigorous methods exist to evaluate the cost effectiveness of these technologies.

An example is provided in Section 2.6 where the evaluation of activated protein C for treatment of sepsis using incremental cost per life-year gained demonstrated cost effectiveness for more severe presentations of the disease.

it should be treated. In identifying patient groups with specific needs, it is more feasible to examine the care they receive and whether they are receiving the best care possible. This may help determine where efforts should be targeted to improve the quality of care and its outcomes while helping to control long-term health care costs.

Health Care Utilization Indicators by Health Status Using Clinical Risk Groups

Important questions arise when exploring health care utilization such as... *How do various health conditions contribute to utilization and costs in Alberta?* and... *What is the quality of care for patients with these conditions?*

While future data sources such as electronic medical records and chronic disease registries combined with clinical quality measures will ultimately provide a clearer picture, answers are needed now. These issues can be examined in a limited way today using available administrative data and a data grouping tool known as clinical risk groups (CRGs).^{5,6}

At the broadest level, this tool classifies individuals into one of nine health states and either singular or multiple disease categories. CRGs can be used to examine health service utilization both concurrently and prospectively.

Concurrent analysis relates the health status and utilization within the same time period, whereas prospective analysis relates utilization in subsequent years to health states in the original time period.

Where noted, prospective analysis is used as it permits modelling of future health care demand for specific conditions, and can determine the rate at which simple conditions evolve into more complex or severe conditions at a population level. This analysis can then be used to estimate resource use and cost for such transitions.

1.3 Proportion of Population Growth by Clinical Risk Group and Proportion of Total Direct Cost by Clinical Risk Group

Table 1 shows how Albertans were classified in high-level CRGs and the growth rate in each CRG from 2001 to 2007. Note that over the period every group grew; however, malignancies grew faster than any other group and individuals with more than one chronic condition grew much faster than the overall population.

The table also shows total estimated direct costs for specific health care services in 2006/07, given population classification for 2005/06.ⁱⁱ This table underestimates total cost for these particular sectors because it excludes indirect costs such as diagnostic imaging, laboratory tests, infrastructure, administration and physician costs for inpatient and emergency department visits.

Combined, annual CRG categories for all chronic illness account for 61% of the total assessed health care costs yet represent only 30% of the Alberta population. From an economic perspective, this result underscores the vital importance of effectively managing chronic illness.

ⁱⁱ Because utilization and costs are taken from 2006/07 and health status is taken from 2005/06, a person had to be active in Alberta from March 2005 through to March 2007 to be included in the analysis. Inpatient costs come from the Management Information System (MIS) accounting information as do emergency department (ED) costs. These costs were then apportioned across inpatient and ED visits based on relative expected costs using the Case Mix Grouper and Ambulatory Care Classification System groupers respectively. Physician visits and costs reported are based on fee-for-service billings from physician offices, ambulatory clinics and long term care nursing homes. Shadow billing costs were approximated using the Canadian Classification of Procedures codes.

Table 1. Prospective 2006/07 direct costs by population classification in 2005/06

HEALTH STATE (2005/06)	POPULATION	ANNUAL POPULATION (%) GROWTH 2001-2007	POPULATION (%)	TOTAL DIRECT COSTS (2006/07)					COST (%)
				GP COSTS (\$)	SPECIALIST COSTS (\$)	ED COSTS (\$)	INPATIENT COSTS (\$)	COMBINED COSTS (\$)	
Healthy/no major condition	1,893,931	1.3	62.5	179,994,743	101,314,207	83,190,788	371,010,395	735,510,133	30.3
Significant acute	228,873	0.4	7.6	35,738,677	20,288,842	16,622,111	78,487,138	151,136,768	6.2
Single minor chronic	328,272	2.3	10.8	66,226,572	49,467,246	22,127,702	152,761,763	290,583,282	12.0
Multiple minor chronic	49,597	2.0	1.6	17,235,250	13,492,106	5,588,413	42,804,958	79,120,727	3.3
Single dominant or Moderate chronic	400,150	3.3	13.2	96,817,904	81,711,448	37,689,743	390,490,404	606,709,499	25.0
Pairs - Multiple dominant/ Moderate chronic	111,004	4.3	3.7	46,272,361	41,833,296	22,484,035	318,856,699	429,446,391	17.7
Triples - Multiple dominant chronic	6,660	4.6	0.2	4,043,797	3,248,080	2,767,336	60,118,208	70,177,420	2.9
Malignancies	6,465	5.1	0.2	2,309,659	2,254,212	1,439,624	28,213,755	34,217,251	1.4
Catastrophic	3,504	4.9	0.1	869,181	3,446,149	1,192,817	27,958,005	33,466,152	1.4
Overall	3,028,456	1.7	100	449,508,145	317,055,586	193,102,568	1,470,701,326	2,430,367,625	100

Note: Prospective utilization is reported. Utilization in 2006/07 is reported relative to the health states in 2005/06. Direct costs are those currently attributable to the patient and exclude such things as diagnostic imaging, laboratory tests, administration and acute care fee-for-service. Combined costs are the sum of the four cost columns. Individuals included in cost statistics had to be active in Alberta from March 2005 to March 2007.

Data source: Alberta-inpatient morbidity, physician claims, ambulatory care data, MIS financial information and population registry

Analysis: Health Quality Council of Alberta

Linking System and Clinical Indicators

Effective chronic disease management must be undertaken in primary care.

Management of chronic disease in primary care is explored in Sections 2.5 and 2.8.

1.4 Average Prospective Per Person Utilization by Clinical Risk Group

Examining average prospective utilization rates, it is apparent they also vary significantly across the health states. As shown in Table 2, individuals with multiple chronic conditions consume dramatically more service across almost all service areas, especially with respect to inpatient days.

Table 2. Average prospective per person utilization (2006/07)

HEALTH STATE (2005/06)	AVERAGE UTILIZATION (2006/07)			
	GP VISITS	SPECIALIST VISITS	ED VISITS	INPATIENT DAYS
Healthy/no major condition	2.52	0.76	0.36	0.22
Significant acute	4.21	1.20	0.61	0.38
Single minor chronic	5.20	1.91	0.54	0.56
Multiple minor chronic	8.82	3.33	0.91	1.13
Single dominant or Moderate chronic	6.70	2.57	0.68	1.38
Pairs - Multiple dominant and/or Moderate chronic	11.50	4.71	1.37	4.41
Triples - Multiple dominant chronic	17.75	6.86	2.30	14.69
Malignancies	9.39	4.78	1.36	5.68
Catastrophic	6.94	15.48	2.09	9.58
Overall	3.97	1.39	0.50	0.65

Note: Individuals included had to be active in Alberta from March 2005 to March 2007.

Data source: Alberta–inpatient morbidity, physician claims, ambulatory care data, MIS financial information and population registry

Analysis: Health Quality Council of Alberta

1.5 Average Prospective Per Person Direct Costs

When health care service visits are equated to costs, Table 3 shows the average person in the Healthy category accrued direct costs of about \$390 in 2006/07. This contrasts sharply with the average cost of almost \$11,000 for an individual in the Triples – Multiple dominant chronic category. The majority of these costs for people with chronic conditions are generated as hospital inpatients; however, management of chronic disease occurs primarily in the community. Therefore, costs saved due to more effective chronic disease management in primary care will be realized largely in the acute care sector rather than in primary care.

Table 3. Average prospective per person direct costs (2006/07)

HEALTH STATE (2005/06)	AVERAGE DIRECT COSTS (\$) (2006/07)				
	GP COSTS	SPECIALIST COSTS	ED COSTS	INPATIENT COSTS	COMBINED COSTS
Healthy/no major condition	95	53	44	196	388
Significant acute	156	89	73	343	660
Single minor chronic	202	151	67	465	885
Multiple minor chronic	348	272	113	863	1,595
Single dominant or Moderate chronic	242	204	94	976	1,516
Pairs - Multiple dominant and/or Moderate chronic	417	377	203	2,872	3,869
Triples - Multiple dominant chronic	607	488	416	9,027	10,537
Malignancies	357	349	223	4,364	5,293
Catastrophic	248	983	340	7,979	9,551
Overall	148	105	64	486	803

Note: Individuals included had to be active in Alberta from March 2005 to March 2007.

Data source: Alberta–inpatient morbidity, physician claims, ambulatory care data, MIS financial information and population registry

Analysis: Health Quality Council of Alberta



1.6 Alberta Average Utilization for Selected Diabetes Clinical Risk Groups

While CRG analysis focuses on a limited period of time, thereby underestimating the true prevalence of diabetes in the population, it can still be very helpful characterizing the relative health care utilization and costs of individuals who fall into specific diabetes groups.

Focusing specifically on a population of 46,993 individuals in the Diabetes-only CRG, Table 4 illustrates that in 2006/07 such a person averaged 6.9 general practitioner (GP) visits, 2.7 specialist visits and 1.4 inpatient hospital days. It also shows health service

utilization increases as other chronic conditions are added. For example, in the Diabetes and Hypertension classification, the average utilization increases across all service areas except emergency department (ED) visits. With three conditions (Diabetes, Hypertension and Cerebrovascular disease), average hospital days increased dramatically from 1.6 to 14.2, and primary care visits (GP, Specialist and ED combined) rose from 13.0 to 20.4.

Table 4. Alberta average utilization* for four specific diabetes CRGs (2006/07)

CRG 2005/06	CRG POPULATION	GP OFFICE VISITS	SPECIALIST OFFICE VISITS	ED VISITS DISCHARGED HOME	INPATIENT DAYS	ED VISITS ADMITTED
Diabetes	46,993	6.9	2.7	0.6	1.4	0.1
Diabetes and Hypertension	9,534	9.2	3.1	0.6	1.6	0.1
Diabetes and Hypertension and Cerebrovascular disease	132	15.7	3.4	1.3	14.2	0.4
Diabetes and Other moderate chronic disease	10,803	10.5	4.4	1.0	3.4	0.2

* Utilization is prospective with CRG classification based on 2005/06 data but utilization based on 2006/07 data.

Data source: Alberta–inpatient morbidity, physician claims, ambulatory care data, MIS financial information and population registry

Analysis: Health Quality Council of Alberta

It is also important to look at the distribution of those health service visits across the diabetes population as some individuals use considerably more services than the average diabetic. It can also demonstrate if individuals with a chronic condition are not receiving even a yearly routine checkup and, therefore, may not be receiving the recommended care for their condition.

This information alone does not tell how many health service visits are appropriate, or how much utilization is preventable with optimal chronic disease management. However, when combined with clinical quality measures, such data helps evaluate alternative approaches to the management of diabetes or other chronic diseases. For example, each diabetic should receive periodic hemoglobin A1c blood tests, foot exams, eye exams and blood pressure checks. If these are monitored and appropriate corrective action taken, then outcomes are expected to improve.

1.7 Transition Rate from Confirmed Diabetes Alone to Diabetes with Other Chronic Diseases

The rate at which individuals move from one health state to another is a potentially important outcome measure as chronic disease management (CDM) programs seek to reduce or delay these transitions. An example of one such CDM program and its activities is provided in Section 2.8.

Accurately estimating transition rates is challenging in the absence of a fully implemented provincial chronic disease registry and associated clinical measures. CRG analysis provides a potential method as it tracks progress from a healthy state through to advanced stages of illness. For example, by focusing on individuals who have diabetes and only diabetes each year for three years and then viewing the health states over the next three years, the transition rates illustrated in Table 5 can be calculated.

Table 5. Three-year transition rate from diabetes alone to other risk groups

CRG DESCRIPTION	PROPORTION OF PEOPLE (%)
Diabetes	62.6
Congestive heart failure and Diabetes	1.1
Diabetes and Advanced coronary artery disease	3.0
Diabetes and Other moderate chronic disease	14.1
Diabetes and Hypertension	5.4
Chronic renal failure and Other dominant or moderate chronic disease	1.2
Chronic renal failure – Diabetes – Other dominant chronic disease	1.0
Congestive heart failure – Diabetes – Chronic obstructive pulmonary disease	0.3
Congestive heart failure – Diabetes – Cerebrovascular disease	0.1
Congestive heart failure – Diabetes – Other dominant chronic disease	0.2
Diabetes – Advanced coronary artery disease – Other dominant chronic disease	0.6
Diabetes – Cerebrovascular disease – Hypertension	0.1
Diabetes – Hypertension – Other dominant chronic disease	0.3

Note: Person had to be active in Alberta from 2001 to 2007 continuously. Deaths are excluded.
Data source: Alberta–inpatient morbidity, physician claims, ambulatory care data, MIS financial information and population registry
Analysis: Health Quality Council of Alberta

As shown, 62.6% of diabetic individuals stayed in the same health state, 5.4% moved to Diabetic with Hypertension, 2.2% moved to a state of Chronic renal failure, while 1.7% developed Congestive heart failure. An even more significant transition rate of 14.1% occurred for individuals who moved to Diabetes with another moderate chronic condition.

Projecting costs for all diabetics making a transition to a poorer health state is difficult because it is not clear how quickly increased health care use and cost will occur after the transition takes place. However, average utilization and costs for people with multiple chronic conditions are much greater than for those with only one chronic condition. As shown earlier in Table 3, individuals with a single minor chronic condition on average generate four times less cost than those with pairs of chronic conditions, and 10 times less than those with a trio of conditions. More important, the human costs are significant in terms of morbidity, reduced function and productivity, and even death. Managing chronic disease and reducing transition rates is about keeping people healthy longer and maintaining or improving their quality of life.

In addition to costing information, data that reflects the extent to which best practice care processes are being followed should also be captured and/or monitored. Evidence that compliance to certain processes of care is causally linked to better outcomes is very strong in some areas, and there is substantial evidence about the best care for individuals with certain diseases.

Although some of the information needed for such quality of care measures is available now, it tends to be contained within many separate data systems throughout the province. Such information should be integrated for the purpose of quality measurement and quality improvement. The electronic health record and electronic medical record could ultimately provide an efficient means of capturing relevant quality information for specific conditions.

Patient Experience Indicators

1.8 Overall Rating of Satisfaction with Health Care Services

Every two years the HQCA conducts a population-level survey, *Satisfaction with Health Care Services: A Survey of Albertans*, which asks Albertans about their general perceptions of and actual experiences with various health care services.⁷ The margin of error at the population level is less than 1.5%. A number of system-level quality measures in the dimension of acceptability are monitored from survey to survey.

Linking System and Clinical Indicators

Reducing transitions from simple to complex chronic disease is an outcome of chronic disease management with significant implications for the long-term health of individuals as well as overall system costs.

Management of chronic disease is explored to some extent in Section 2.5 and more fully in Section 2.8.

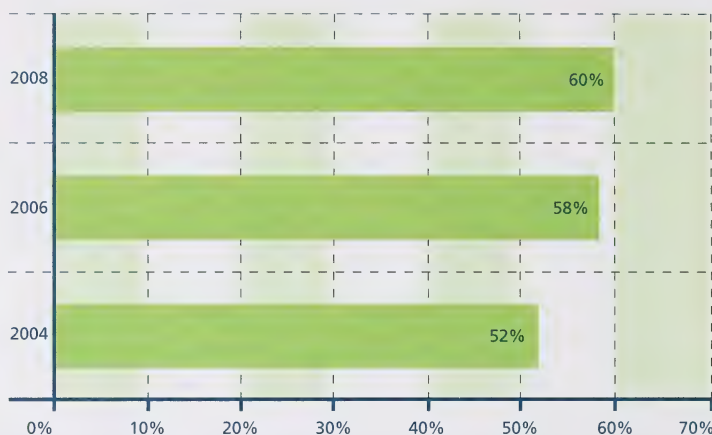
Linking System and Clinical Indicators

Improving patient satisfaction in specific clinical areas will impact global satisfaction with health care services. Enhancing communication between patients and providers in the emergency department and improving wait times have both been shown to improve patient experience and satisfaction.

Satisfaction with emergency department care is explored in Section 2.1.

As shown in Figure 4, there has been a slow but statistically significant improvement in global patient satisfaction with health care services received. Between 2004 and 2008, the proportion of Albertans rating their satisfaction as 4 or 5 out of 5 increased from 52% to 60%.

Figure 4. Per cent of respondents satisfied or very satisfied with the health care services they received in the previous year



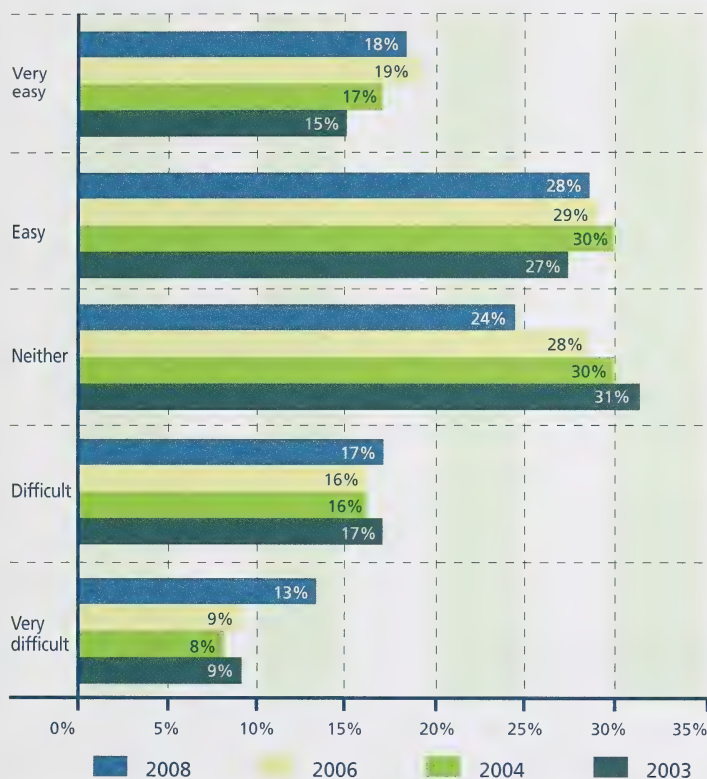
Source: HQCA Satisfaction with Health Care Services Surveys (N=4,039 in 2004, N=4,618 in 2006, N=4,049 in 2008)

1.9 Overall Rating of Access to Health Care Services

The *Satisfaction with Health Care Services Survey* also tracks Albertans' rating of access to health care services. As shown in Figure 5, the proportion of Albertans rating access to health services received as easy or very easy (4 or 5 out of 5) increased significantly between 2003 and 2004 but has not changed significantly since.

At the same time there has been an increase in the proportion of Albertans rating access as very difficult or difficult (1 or 2 out of 5), there is a corresponding reduction in the proportion of Albertans rating access as neutral (3 out of 5). The proportion of residents rating access as very difficult increased from 9% in 2003 to 13% in 2008.

Figure 5. Respondents' ratings of difficulty or ease accessing needed health care services in the previous year

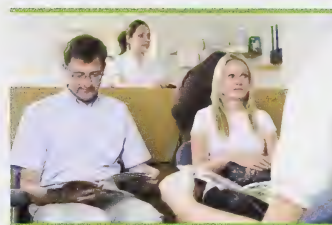


Source: HQCA Satisfaction with Health Care Services Surveys (N=4,004 in 2003, N=4,608 in 2004, N=4,780 in 2006, N=4,035 in 2008)

1.10 Self-reported Experience with Unexpected Harm while Receiving Health Care Services

Alberta does not currently have an integrated provincial patient safety reporting and learning system. The fundamental role of patient safety reporting systems is to enhance patient safety by learning from failures of the health care system.⁸ These reporting systems typically capture safety learning opportunities or near misses as well as instances of unexpected harm. The goal is that this information can help target improvement efforts and system changes to reduce the likelihood of injury to future patients.

There are many stand-alone adverse event reporting systems across the province. However, these systems are not integrated and consequently the ability to monitor unexpected harm and learn from these events at the provincial level is limited. Notwithstanding the difficulties of defining



Linking System and Clinical Indicators

Timely access is a significant challenge in Alberta's health system at present. The solutions themselves are often challenging and multi-faceted. Section 2.2 explores improvements in wait times for surgical procedures as a possible consequence of a standardized care pathway and centralized intake.

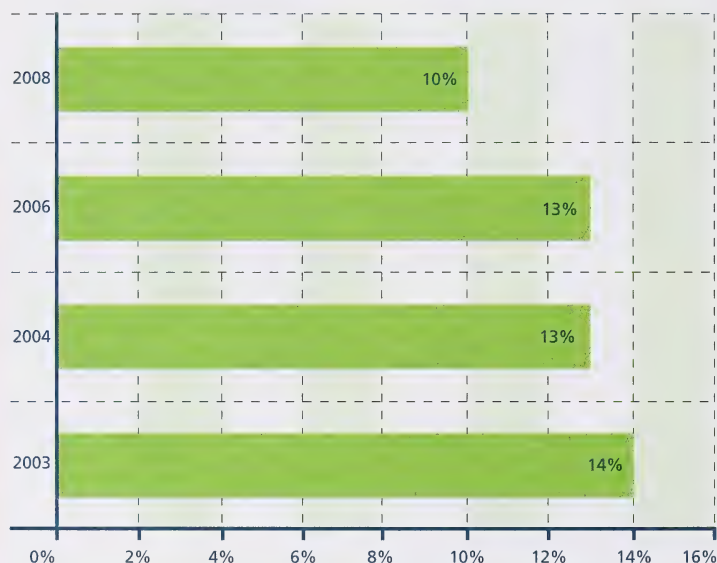
Section 2.4 describes successful strategies that reduce unnecessary patient visits to the emergency department through more appropriate management in primary care.

unexpected harm, one source of such information is the patient or family. Patient experience of unexpected harm is measured in the HQCA's *Satisfaction with Health Care Services Survey*.

The survey defines unexpected harm as harm that can occur to patients as a consequence of the health care they receive. This harm is described as being different than complications or undesirable outcomes that are an expected risk of some treatments or procedures.

As shown in Figure 6, the proportion of Albertans reporting unexpected harm while receiving health care services has dropped significantly from 14% in 2003 to 10% in 2008. In 2008, 50% of all instances of unexpected harm captured in the survey occurred in an acute care setting.

Figure 6. Per cent of Albertans (or immediate family member) experiencing unexpected harm while receiving health care in Alberta in the past year



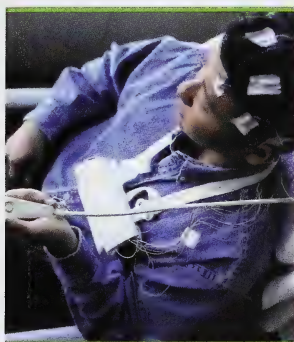
Source: HQCA Satisfaction with Health Care Services Surveys (N=3,283 in 2003, N=4,039 in 2004, N=4,220 in 2006, N=4,302 in 2008)

Linking System and Clinical Indicators

Health care procedures and processes of care are often complex and invasive, with the potential to cause harm if they fail or are suboptimal. A number of effective best practices have been shown to reduce harm to patients; however, these have not been universally adopted.

Methods to reduce ventilator-associated pneumonia are explored in Section 2.12 while methods to reduce surgical site infections are explored in Section 2.13. Methods to prevent the spread of antibiotic-resistant organisms are explored in Section 2.14.

2.0 Clinical-level Indicators



Overview

This section highlights a random selection of health care initiatives and related indicators in specific clinical areas. These initiatives are driven by innovation and the interest of providers to improve the quality of care they deliver, and are fuelled by primary data collection. They illustrate the power of measurement in guiding, evaluating and spreading innovation and quality improvement in health care. In each of the following sections, linkages between clinical-level and system-level indicators are highlighted.

The HQCA defines health care quality and safety in a comprehensive fashion using the six dimensions identified in the *Alberta Quality Matrix for Health*⁹ as described here.

- **Acceptability:** health services are respectful and responsive to user needs, preferences and experiences.
- **Accessibility:** health services are obtained in the most suitable setting in a reasonable time and distance.
- **Appropriateness:** health services are relevant to user needs and are based on accepted or evidence-based practice.
- **Effectiveness:** health services are provided based on scientific knowledge to achieve desired outcomes.
- **Efficiency:** resources are optimally used in achieving desired outcomes.
- **Safety:** mitigate risks to avoid unintended or harmful results.

This section showcases at least one improvement initiative for each of these quality dimensions and the examples reflect activities across the province. Mirroring the real world, there are more initiatives to improve effectiveness and safety than acceptability and efficiency. The quality improvement initiatives had to be already in place in the Alberta health system to be included in this report.

Clinical Indicator Development Facilitates Timely System-wide Application

Appropriate indicators are presented to enable monitoring of these improvement initiatives. The measures were chosen by the initiative group or were conceived by the HQCA to measure the potential impact of similar initiatives. Many of the improvement efforts represent new and innovative approaches to measurement, and as such, should be further refined and validated over time.

The primary purpose of these measures is for front-line quality improvement that enables teams to move forward in real time. Selecting indicators that are relevant to clinical care warrants attention because it facilitates

the spread of successful front-line initiatives across the Alberta health system. Initiatives which can, for example, alleviate overcrowding in emergency departments, optimize the appropriate use of hospitals and emergency departments, improve neonatal care or demonstrate the cost effectiveness of new technologies.

As this section underscores, there are many exceptional solutions being found at this level of the system. The HQCA offers these indicators as a means to effectively monitor progress and this report as a way to promote these outstanding efforts throughout Alberta.

Health Quality Dimension: Acceptability

2.1 Alberta Emergency Departments: Overall satisfaction and rating of care for patients attending Alberta emergency departments

Background

Patient and family centredness is at the heart of the provision of medical care. Yet complex and technical care systems, especially those under stress, can be challenged to provide care in a way that is most acceptable to patients and families. Not surprisingly, perceptions of acceptability often differ. Clinicians tend to focus on the technical quality of care whereas patients concentrate on their communication needs and the interpersonal aspects of care.

The *Alberta Quality Matrix for Health* defines acceptability as health services that are respectful and responsive to user needs, preferences and expectations. Such care includes compassion, empathy and effective communication between care providers and patients. Achieving acceptability is part of establishing an effective partnership between providers and their patients. In this context, acceptability is not just about delivering care the way patients would like to receive it; it is also about helping to improve outcomes through better engagement, support and communication.

Indicator Definition

Numerator: Number of people who rated their satisfaction with emergency department (ED) services as 4 or 5 on a 5-point scale, where 1 equals very dissatisfied and 5 equals very satisfied.

Denominator: Total number of people who rated their satisfaction with ED services.

What the Data Shows

In 2003, 2004, 2006 and 2008, the HQCA conducted a survey called *Satisfaction with Health Care Services: A Survey of Albertans*.¹⁰ The survey results shown in Table 6 indicate that Albertans were concerned with ED services in the province.

The HQCA embarked on a more detailed study of ED patient experience in Alberta in 2007, knowing that most other EDs across Canada and the United States face similar crises of timely access and the associated quality of care issues.

Table 6. Albertans' satisfaction with emergency department services (2003-2008)

SURVEY YEAR	% RATING SATISFACTION AS 4 OR 5 OUT OF 5
2003	50
2004	50
2006	51
2008	58

Source: Health Quality Council of Alberta

Acceptability was examined further in the 2007 facility-level survey of ED patient experience.¹¹ Numerous direct measures were collected, including those that identified and estimated factors influencing the patients' global rating of care.

Overall Care Rating

As shown in Table 7, a majority of rural respondents (75%) rated their overall care as either excellent or very good; however, in urban EDs this proportion dropped to 65%.

Table 7. Albertans' overall rating of emergency department care received (2007)

OVERALL CARE RATING	% URBAN	% RURAL
Excellent	29	41
Very good	36	34
Good	19	15
Fair	9	6
Poor	4	3
Very poor	3	1

Source: Health Quality Council of Alberta

The majority of the survey questions reflected patients' perceptions of their quality of care. These questions were grouped into sets, each addressing a common underlying issue and the data analyzed accordingly. The analysis revealed a strong correlation between these related questions (combined as composite variables) and the patients' overall care rating. Beginning with

the strongest association to the overall care rating, composites ranked in the following order:

1. Staff care and communication
2. Respect
3. Pain management
4. Wait time and crowding
5. Cleanliness
6. Discharge information

Although recent attention has focused on wait times in EDs, the ranking above shows that staff care and communication are most important to the overall care rating from the patient's perspective followed by respect. The questions that make up these top two composites address doctors and nurses communicating effectively with patients about their condition, staff listening to patients' concerns, staff spending enough time with patients, and the respect and courtesy ED staff show patients.

The HQCA also looked at several specific issues that are of particular importance to the patient experience. The survey results demonstrated that these items can have a strong negative impact on the overall rating of emergency care if not addressed effectively:

- Staff not helping when patient needed attention
- Staff not doing enough to help with pain
- Long wait time to see physician (especially > 4 hours)

Examples of Actions for Improvement

The following two examples show how one Alberta health region tackled ED care issues that affect the patient experience. Capital Health has employed personal care assistants called ED navigators. Their role is to communicate with patients and families about the ED process, to enhance patient comfort while waiting and to help ensure that the patient care team is aware of any changes in the patient's medical condition. They work in the waiting areas of four Edmonton EDs.

Capital Health also introduced a triage liaison physician (TLP) position to assist with ED throughput. This physician evaluates ED patients and initiates early

investigation and treatment before patients reach traditional patient care areas. The TLP answers incoming physician calls, supports and assists triage nurses, evaluates ambulance patients to determine who could safely wait, and initiates patient evaluation and diagnostic studies.

Both these roles are likely to have an impact on patient experience given the HQCA's previous findings. Evidence for the effectiveness of ED navigators has not been established although a positive impact on patient experience might be expected. Evaluation showed no significant change in patient experience following the addition of navigators; however, crowding and wait times had also increased. This demonstrates the challenge of evaluating innovations with limited data in the context of many interrelated and changing factors that also influence care and the care experience. The use of more rigorous research methods may be required to understand whether such initiatives are effective relative to other strategies. The navigator strategy may only prove to be relevant when the clinical care system is not performing as intended due to excessive crowding and wait times.



Linking System and Clinical Indicators

Satisfaction with emergency departments (EDs) is one of the lowest for all health care sectors. Improving satisfaction with ED care is likely to improve the overall satisfaction rating with health care services.

The overall rating of satisfaction with health care services is reported in Section 1.8.

The use of a TLP was recently evaluated in the University of Alberta ED.¹² The study found that overall median length of stay for all patients was reduced by 36 minutes. Although not a statistically significant difference, there was also a reduction in patients who left without being seen – from 7.9% of control group patients compared with 6.3% of patients visiting during TLP shifts. The study's positive outcome led to TLP shifts being added at five Edmonton EDs and further expanded at the two academic teaching hospitals.

Discussion

Given the complexity of emergency care, a more robust ED information system should be adopted and results conveyed to staff to facilitate definitive evaluation of initiatives targeting crowding and wait times in these settings.

The HQCA also recognizes that considerable evidence correlates effective clinician-patient communication with desired health outcomes. Good communication has been shown to improve the capture and assessment of health-related information, facilitate compliance with follow up and discharge instructions, and enhance patient experience and satisfaction.^{13, 14, 15, 16, 17, 18, 19, 20} Programs designed to improve clinician-patient communication in an ED setting exist and could be applied throughout Alberta.

Health Quality Dimension: Accessibility

2.2 Acute Care Access from the Community: Median wait time to receive selected elective surgeries from the first available surgeon

Background

Equitable and timely access to services is a primary goal of every publicly funded health care system. Waiting lists are widely used in Canada to monitor access to health services when there is an imbalance between supply and demand. Non-urgent surgical waiting lists generally comprise patients with chronic conditions or disabilities who have been assessed by a specialist rather than patients with acute or immediately life-threatening conditions. Possible consequences of lengthy wait times include unrelieved or worsening symptoms, poor or deteriorated quality of life and, in some cases, permanent harm or death.²¹

Public concern and media coverage of delays in patient care due to lengthy wait times have led Canada to undertake initiatives to reduce wait times in priority health care areas. In 2004, Canada's First Ministers committed to achieving "meaningful reductions in wait times" for elective surgeries (cancer, heart, joint replacements and sight restoration) and diagnostic imaging by March 2007.²² These surgical priority areas constitute 19% of all surgical cases in the country.

The First Ministers also issued wait time benchmarks for these surgical areas. Alberta identified even more aggressive wait time goals for all five priority areas and developed an online Alberta Waitlist Registry that provides procedure, urgency and physician-specific information on wait times.²³ Other groups across Canada have also undertaken initiatives to set benchmark wait times and reduce wait times for specific procedures. These include the Wait Time Alliance,²⁴ the Alberta Hip & Knee Replacement Project,²⁵ and the Western Canada Waiting List Project.²⁶

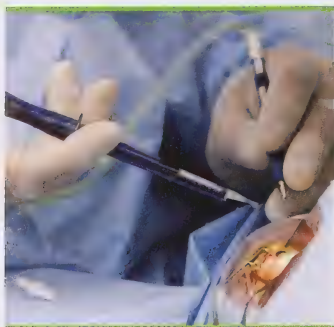
To date, wait time management initiatives undertaken in provinces across Canada have adopted one or more of the following four strategies:^{27, 28, 29}

1. Improve understanding of who will benefit most from care; capture and prioritize wait lists to ensure the most urgent cases receive care most quickly; and create a central registry to inform patients and referring physicians of specialist availability and associated wait times.
2. Increase the number of procedures being done.
3. Increase the efficiency of care processes in order that more procedures can be done with available resources.
4. Focus on wellness and disease prevention in an effort to reduce the number of people who become sick enough to need care.

Patients can choose the surgeon they want to perform their elective surgery, and they can choose any physician regardless of the length of his/her wait list. To help guide their decision, the Alberta Waitlist Registry provides wait times for each surgeon. In turn, each physician periodically organizes his/her wait list to give higher priority to patients with more severe health issues.

Indicator Definition

Median Wait Time – For each surgeon, the time between booking and day of surgery for the first half of surgery patients in the last 90 days. To calculate this indicator, each surgeon's list of waiting patients was sorted from the shortest to longest wait time. This sorted distribution was then split in half, with the median the value that divided the first 50% of the population from the second. The median is more indicative of central tendency than the mean, which is strongly influenced by extreme values (outliers). The figures that follow depict the distribution of surgeons from the shortest to the longest median wait time. This distribution was used instead of the aggregate median of all surgeons to give a more accurate view of actual wait

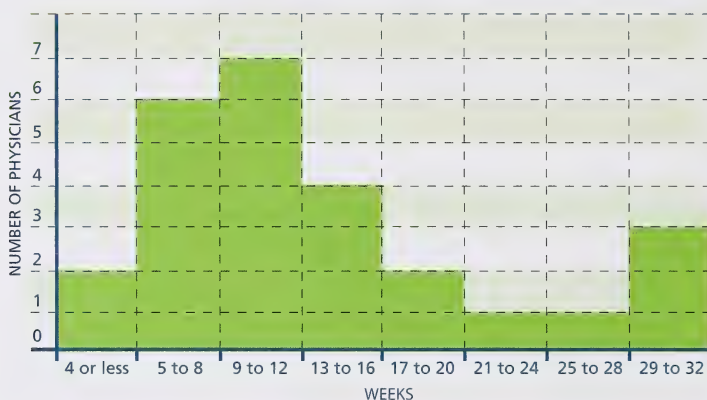


times. Notably, it shows the wait time to the first available surgeon as well as the range of availability for all surgeons performing the specific surgery in a region.

What the Data Shows

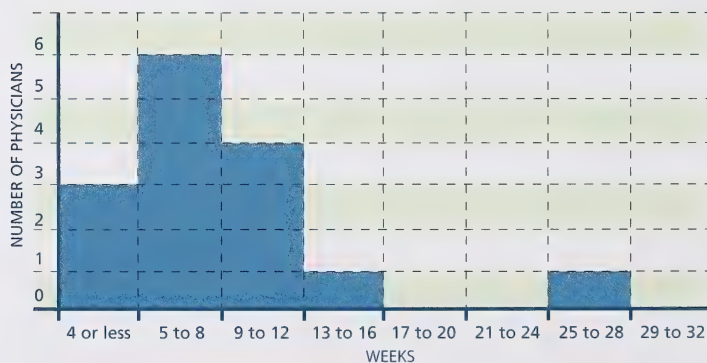
Knee replacements and first cataract surgery were used due to high volumes. Detailed data from the Calgary and Capital health regions is presented (Figures 7-10), as well as an overview of the shortest and longest wait times for these specific surgeries in the Aspen, Calgary, Capital, Chinook, David Thompson, East Central and Palliser areas (Table 8).

Figure 7. First cataract surgery: Distribution of surgeons by the time 50% of their patients were completed (Calgary Health Region, August 31, 2008)



Data source: Alberta Waitlist Registry – www.ahw.gov.ab.ca/waitlist
Analysis: Health Quality Council of Alberta

Figure 8. First cataract surgery: Distribution of surgeons by the time 50% of their patients were completed (Capital Health, August 31, 2008)



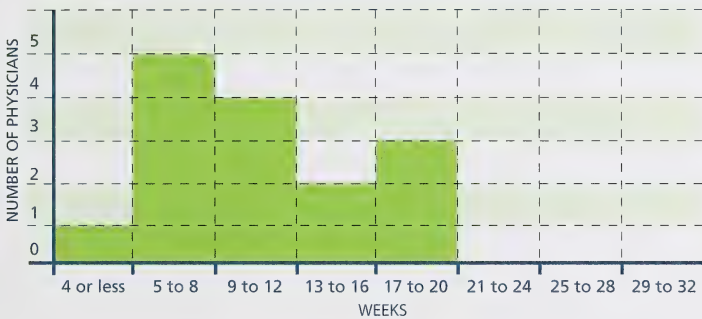
Data source: Alberta Waitlist Registry – www.ahw.gov.ab.ca/waitlist
Analysis: Health Quality Council of Alberta

Figures 7 and 8 show the range and distribution of surgeon availability for cataract surgery varied from four weeks or under to 32 weeks in Calgary and from four weeks or under to 28 weeks in Capital. In both regions, surgery was available in four weeks or less from the first available surgeon.

Figures 9 and 10 show the range and distribution of surgeon availability for knee replacement varied from four weeks or under to 20 weeks in Calgary, and from five to eight weeks to 33 or more in Capital. This difference in access time to the first available surgeon is not clinically significant for this specific surgery.



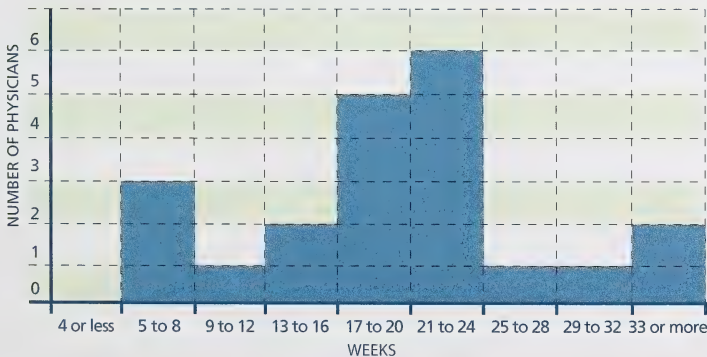
Figure 9. Knee replacement surgery: Distribution of surgeons by the time 50% of their patients were completed (Calgary Health Region, August 31, 2008)



Data source: Alberta Waitlist Registry – www.ahw.gov.ab.ca/waitlist

Analysis: Health Quality Council of Alberta

Figure 10. Knee replacement surgery: Distribution of surgeons by the time 50% of their patients were completed (Capital Health, August 31, 2008)



Data source: Alberta Waitlist Registry – www.ahw.gov.ab.ca/waitlist

Analysis: Health Quality Council of Alberta

Table 8 shows the range of the distribution of first cataract and knee replacement surgery by health region using the median wait time as the access indicator. For all surgeries, there was variability within each region and across the regions between the shortest and longest wait times to access a particular surgeon. Measured against the shortest surgeon-specific wait times, all regions fell within Alberta's 16 week wait time goal for cataract surgery and its 20 week goal for knee replacement.

Table 8. Median wait time for selected elective surgeries* by Alberta health region and selected surgeons (August 31, 2008)**

HEALTH REGION	FIRST CATARACT SURGERY		KNEE REPLACEMENT SURGERY	
	Surgeon with shortest wait time (weeks)	Surgeon with longest wait time (weeks)	Surgeon with shortest wait time (weeks)	Surgeon with longest wait time (weeks)
Aspen	11	NA	17	NA
Calgary	2	32	4	19
Capital	3	27	6	88
Chinook	6	29	5	35
David Thompson	4	21	20	24
East Central	4	32	8	NA
Palliser	13	NA	9	45

* Inpatient and day patient. ** Best and worst wait time among active surgeons: minimum of two waiting and two persons served.

NA = not available; only one specialist for the specific surgery

Data source: Alberta Waitlist Registry – www.ahw.gov.ab.ca/waitlist

Analysis: Health Quality Council of Alberta

Examples of Actions for Improvement

The Alberta Hip & Knee Replacement Project (AHKP)³⁰ tested a new model of care for patients across Alberta. The model was designed to improve the clinical outcomes and efficiency of these procedures as well as access to them. A new clinical care path standardized the entire pathway from primary care through surgery, recovery and rehabilitation. Tools and processes for standardization included a consultation referral template, patient contracts, customized treatment plans, a patient optimization program, evidence-based clinical practices and procedures, and scheduled patient follow up. All aspects of the new care pathway were based on informed decision-making using a combination of the best available evidence and standards of care. Fully integrated patient care delivered by a multidisciplinary

team was a critical feature of the new care pathway, as was a single intake process.

The project was completed in the spring of 2006 and involved almost 3,500 patients including 1,638 surgical patients who used the new care pathway. Results were published in June 2007 and showed the outcomes of patients followed for three months after surgery.

The new approach focused on improving the front end of care and managing the care pathway from initial referral to recovery. For the first time, family physicians were encouraged to send a standardized hip and knee referral form to a central referral point rather than to a specific orthopedic surgeon. This referral template provided all of the key intake information for the

specialist consultation. During the course of the pilot project, 33.5% of patients seen at the clinic were deemed nonsurgical or chose not to proceed with surgery at the time of the visit. For those who had surgery, the median time from family physician referral to clinic assessment was 21 business days and from clinic visit to surgery was 7.5 weeks. This represented a significant change from the control group wait times where these same components were measured as 145 days and 58 weeks respectively.

One key element in the new clinical care model was the central intake clinic. This single point of entry allowed for standardized, multidisciplinary central intake assessment for patients as well as access to all facets of bone and joint care. Patients assessed as not requiring surgery at the time of the clinic visit were referred back to their family physician with a medical plan.

Those who proceeded to surgery were assigned a case manager to facilitate their individual care pathway. The clinic reassessed each patient and provided specific education for patients moving on to surgery. A provider-patient contract encouraged surgical patients to take an active role in their care and recovery. Inpatient care was managed through standardized inpatient protocols. Rehabilitation care or home care was made available if the clinical goals were not met by discharge from acute care. Follow-up care was provided at regular intervals at the central clinic.

The project results showed that by providing a single point of entry and a standardized multidisciplinary care model, it was possible to reduce wait time for a specialist consultation by 86% and surgery wait time by 90%. In the AHKP group, the cost per case decreased by 2%. The savings gained in this group through lower average surgery time and lower average length of stay in acute care (reduction of 30%) were balanced with the increase in resources used in the initial referral to pre-surgery period. The value of this rebalancing was clearly demonstrated in the reduction in wait times and improvements in clinical outcomes and patient satisfaction.

Discussion

A central intake system is fundamental to the effective management of access to any specific procedure. As seen in the AHKP initiative, this system allowed a case manager to access the next level of care with the next available specialist. Standard assessment criteria help specialists define collectively which patients will benefit from an elective surgery, and family physicians identify the appropriate patients to refer to specialists.

Distribution of wait time by specialty will be a useful indicator for policy-makers as it provides a realistic view of the range of wait times and the availability of services.

Linking System and Clinical Indicators

Individuals waiting a long time for elective surgeries can be expected to rate their overall access to health care services poorly.

The overall rating of access to health care services is reported in Section 1.9.

2.3 Acute Care Access from Emergency Departments: Median length of time from emergency department arrival to admission for selected life-threatening conditions

Background

Emergency departments (EDs), which provide services 24 hours a day seven days a week, were primarily established to treat seriously ill and injured patients requiring immediate care.³¹ However, over time, these departments have come to function as de facto safety nets by providing a full range of unscheduled medical care to everyone who presents regardless of the severity of their condition.

As a consequence, providing timely treatment and avoiding unreasonable wait times is a constant challenge especially when EDs are crowded. ED crowding is generally defined as situations where the demand for emergency services exceeds the ability to provide quality care within a reasonable time. It is now widely recognized that ED crowding is a complex systemic problem most effectively addressed through multifaceted, integrated and comprehensive interventions that impact the end-to-end emergency care process and its interconnections with public health, primary, secondary, tertiary and community-based care services used by ED patients before and after their ED visits.^{32, 33, 34}

There are approximately two million visits to Alberta EDs annually. For each visit, departments are expected to prioritize, potentially stabilize, diagnose, provide initial treatment, and move the patient to the appropriate level of care within a short period. This is no easy task given the huge variety of potential ailments and injuries and the current severe overcrowding facing many high-volume and urban EDs in Alberta.

Due to heavy public use, the wide range of presenting conditions and limitations on clinical and diagnostic resources, EDs need to prioritize their work. This is done by assessing all patients at intake and using the Canadian Triage and Acuity Scale (CTAS) guidelines to triage patients into five categories according to the

severity of their presenting conditions. Importantly, the guidelines designate time intervals within which patients at each CTAS level should be initially assessed by a physician and reassessed by clinical staff during their ED stay.^{35, 36} A corollary of the use of CTAS guidelines is that the appropriateness of ED patients' wait times should vary by the severity of their condition rather than the order of arrival or the median length of stay of ED patients in all triage categories.

Keeping in mind that a large proportion of ED patients require less-urgent and non-urgent care, it follows that a good access measure of ED care is the median length of time from ED arrival to inpatient hospital admission for severe and life-threatening conditions. To illustrate this, two such conditions that can be difficult to diagnose were examined – necrotizing fasciitis and appendicitis.

Indicator Definition

Median Length of Stay – Time between ED registration/triage and movement to an acute care unit or surgery for the first half of patients in a predefined period.

What the Data Shows

There are many presentations of cellulitis/septicemia in Alberta EDs; however, only a small number evolve into necrotizing fasciitis. In 2005/06, there were between 50,000 to 60,000 annual ED visits for cellulitis in Alberta, and fewer than 100 people actually had necrotizing fasciitis. Necrotizing fasciitis is an especially aggressive infection with very high mortality rates of approximately 20% or a high chance of permanent disability.

Although there are over 70,000 presentations annually to emergency with the potential to be appendicitis, there are only around 3,500 appendectomies a year. It is easy

to see how urgent cases of both appendicitis and necrotizing fasciitis could be overlooked. This underscores the importance of continually monitoring patient flow through and outcomes associated with such time sensitive conditions.

Figure 11 presents median wait time from ED arrival to hospital admission for patients with necrotizing fasciitis. Overall, the results were fairly good considering the time it takes for physicians to see patients, make a diagnosis, administer antibiotics and gauge effectiveness. However, around 20% of the patients shown here presented to an ED and were discharged just prior (within 36 hours) to the ED visit that led to their hospital admission.

**Figure 11. Emergency department median length of stay (LOS):
Patients presenting with cellulitis/septicemia and admitted with
a necrotizing fasciitis diagnosis (2004/05 – 2006/07)**

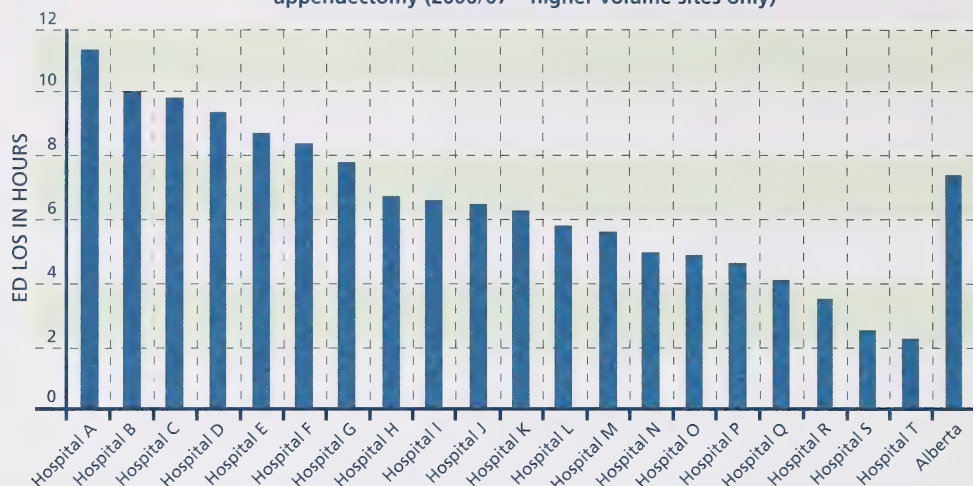


Note: This is a sample where the patient was said to come from ED and a link could be found between ED and inpatient records. If necrotizing fasciitis diagnosis was a 'post-admit' type, then the case was excluded. The hospitals had to have at least four cases to be included.

Data source: Alberta-inpatient morbidity and ambulatory care data

Analysis: Health Quality Council of Alberta

Figure 12. Emergency department length of stay (LOS): Patients presenting with abdominal pain and admitted for appendectomy (2006/07 – higher volume sites only)



Data source: Alberta–inpatient morbidity and ambulatory care data
Analysis: Health Quality Council of Alberta

Linking System and Clinical Indicators

Long wait times in emergency departments (EDs) have a significant impact on how patients rate their overall access to health care services and their overall rating of the quality of care. Long wait times in EDs are also a potential safety issue with increased risk of harm.

Overall access is reported in Section 1.9. The proportion of patients who experienced unexpected harm while receiving health care services is reported in Section 1.10.

Figure 12 shows the median wait time from arrival at ED to hospital admission for patients who presented with abdominal pain and were admitted for an appendectomy.

Ideally, more than just the overall ED length of stay needs to be considered. More actionable information can be obtained by looking at: 1) the time from triage to physician assessment; 2) the time from ordering to getting results from the lab or radiology exams; 3) the time from the decision to call a hospitalist or specialist to the time of this second assessment; and, 4) the time from the decision to admit to the real hospital admission. Once the patient is admitted, the wait time until surgery and length of hospital stay need to be looked at, and an analysis of patient outcomes should be done.

Examples of Actions for Improvement

The HQCA was unable to find a clinical pathway implemented for abdominal pain in the ED; however, Capital Health's University of Alberta Hospital (UAH) has successfully employed clinical practice guidelines (CPG) for cellulitis and asthma to reduce practice variation.

Dr. D. Choi and his team first developed a printed order for intravenous therapy to be used among patients with cellulitis.³⁷ After full implementation

of the printed order the process became electronic. Cellulitis cases were randomly selected for review and physicians were unaware of the study at the time of patient contact to avoid bias. A standardized audit form was used to collect information from the charts.

A total of 194 charts were included in this study. The evaluation showed decreased variability of antibiotic therapy, more use of a single agent with broad coverage and less use of anaerobic agents over the study period. Hospital admission was lower at all times in the CPG groups.

The following evaluation of an asthma care map (ACM)³⁸ was developed by Dr. B. Rowe and his team at the UAH ED. Asthma exacerbations are common ED presentations across Alberta. A patient with asthma presents every 16 minutes to an ED in this province. Despite the availability of numerous CPGs for asthma management, a gap remains in the optimal use of anti-inflammatory agents in ED settings. To fill this gap, the introduction of an ACM was evaluated over three time periods: pre-implementation, following implementation (first evaluation) and 18 months later (second evaluation). A random sample of 387 patient charts was reviewed by research assistants using a standardized audit form.

After full implementation, the adherence with the ACM increased to 67% and was maintained at 70% at the second evaluation. Adherence was not universal across all components of the ACM. Discharge plans were the least well documented. Despite the fact asthma patients spent longer in the ED over the study (pre: 181 minutes; post: 209 minutes; final: 265 minutes), the quality of their care improved.

For example, administration of timely systemic corticosteroids reduces hospital admissions. Before introduction of the ACM, 57% of patients received

this treatment and only 36% in the first hour. After the ACM (second evaluation), 75% of patients had received this treatment and 55% in the first hour. Prescription of systemic corticosteroids at discharge had increased towards the goal of 80%: 55% (pre), 66% (first) and 69% (second). Prescription of inhaled corticosteroids at discharge had increased towards the goal of > 75%: 24% (pre), 45% (first) and 61% (second). Antibiotic use decreased from 9% (pre) to 0% (first, second), which is a best practice standard.

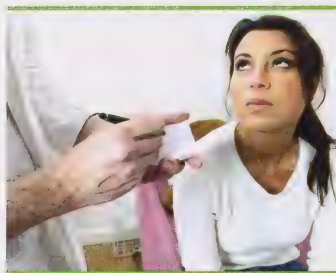
Using a variation of Capital Health's ACM, Dr. D. Mackey and colleagues at Lethbridge Regional Hospital and Chinook Health Region achieved better care in the ED setting but no increase in the prescribing practices at discharge.³⁹

Discussion

In general, physicians tend not to use CPGs. If a CPG can improve a physician's efficiency, CPGs may be more widely accepted. CPGs need to be evidence-based, sensible and developed centrally; however, they should be edited locally to account for unique processes and have a champion to encourage uptake.

In many EDs, electronic CPGs are located on desktop computers. It may be that uptake and use of CPGs will improve with accessibility through hand-held electronic devices that make CPGs readily available at the bedside. Such CPGs need to have defaults in place so the usual care options can be automatically selected.

Conditions such as cellulitis and abdominal pain, which are high volume ED presentations with potentially serious consequences if misdiagnosed, should be considered for the development of CPGs along with the requisite resources needed from senior management for implementation.



Health Quality Dimension: Appropriateness

2.4 Emergency Departments: Proportion of patients who used emergency department/urgent care services for conditions that could be managed at family physician offices

Background

Emergency departments (EDs) and walk-in clinics share similar delivery models focused on acute situations or the complications of chronic ones. However, they lack an important component of the continuum of care – follow up and the ongoing management of diseases/conditions.^{40, 41, 42, 43, 44} Many acute events seen in EDs relate to a previous physician visit. Information from that visit may not be available in the ED or walk-in clinic, and the learning opportunity about the progression of a disease/condition in a particular patient may be lost.

For this, and the reasons listed below, the treatment of such conditions at family physician offices allows for proper follow up and better patient outcomes:

- Patients may respond differently to standard treatments and require further treatment adjustments.
- Patients may have an adverse drug event and require a change in medication.
- Some acute conditions are exacerbations of chronic ones that only an in-depth patient history interview and physical exam can capture.
- Family physicians already caring for the patient will have a better and faster understanding of possible acute exacerbations of chronic conditions.

Indicator Definition

Numerator: Number of ED/urgent care visits for diseases/conditions sensitive to management at family physician offices (general practice sensitive conditions [GPSC]).

Denominator: Total number of ED visits.

What the Data Shows

The HQCA developed the indicator above, which should be sensitive to the appropriate use of EDs and urgent care centres and help quantify the proportion of ED/urgent care visits better suited to management by family physicians. The Canadian Institute for Health Information uses a similar indicator – ambulatory care sensitive conditions – an inpatient acute care hospitalization rate for conditions where appropriate ambulatory care

prevents or reduces the need for hospitalization.⁴⁵ Instead of undertaking the controversial task of selecting diseases/conditions to create such an indicator, the HQCA identified diseases/conditions that were the cause of Alberta ED/urgent care visits in 2006/07, which had a probability of transfer to acute care as an inpatient lower than 1%. Examples include conjunctivitis and migraine. This full list of diseases/conditions was used to compare different regions and could be used to monitor provincial data moving forward. (This list is available from the HQCA on request). The HQCA assumed for its calculations that treatment of all injuries or traumas was appropriate at an ED.

Table 9 shows that for all of Alberta, the proportion of GPSC was 28% of ED/urgent care visits in 2006/07; within the health regions, this proportion varied from

18% to 40%. In other words, 565,943 ED/urgent care visits could have been provided in more appropriate settings such as family physician offices. Injuries or traumas made up 23% of all ED/urgent care visits and the remainder resulted from diseases/conditions that generated admission to acute care in at least 1% of the cases.

This information provides baseline data against which improvement can be measured. The expectation is that more effective provision of primary care services would result in improvements to this disproportionately high rate of GPSC. It is interesting to note that had the HQCA chosen to calculate the GPSC using visits with a probability of transfer to acute care as an inpatient lower than 5%, the proportion of identified visits would have risen to 44% or 875,575.

Table 9. Proportion of ED/urgent care visits for conditions that could be managed at family physician offices by Alberta health region (2006/07)

HEALTH REGION	NUMBER OF VISITS DUE TO GPSC	TOTAL NUMBER OF VISITS	PROPORTION OF GPSC (%)
Chinook	22,089	98,185	22
Palliser	21,670	72,799	30
Calgary	109,316	490,662	22
David Thompson	90,339	269,799	33
East Central	37,247	96,100	39
Capital	82,356	451,953	18
Aspen	92,421	234,771	39
Peace Country	71,510	179,481	40
Northern Lights	38,995	105,282	37
Alberta	565,943	1,999,032	28

Data source: Alberta-ambulatory care data

Analysis: Health Quality Council of Alberta

Examples of Actions for Improvement

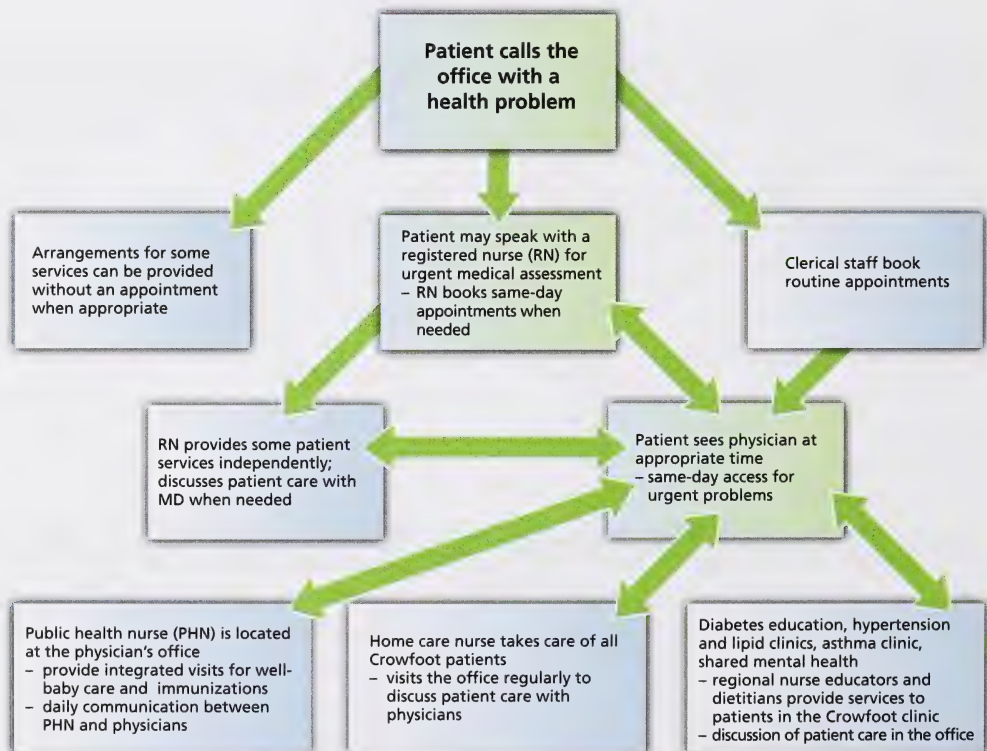
The Crowfoot Village Family Practice

A new model for family physician practices has been implemented successfully by the Crowfoot Village Family Practice in Calgary, Alberta.⁴⁶ In 1999, the Crowfoot practice transitioned from a typical fee-for-service model to the more collaborative patient-based funding model represented in Figure 13.

A difference in the new model is that patients have the opportunity to complete as many necessary procedures in one visit as possible. Results showed that the number of patients physicians saw in the same work day decreased slightly (36 to 34), indicating that more time was spent per patient.

Among patients, the proportion of services provided by outside visits decreased from 21% to 8%, suggesting better 24/7 coverage of patient issues and greater continuity of care by the Crowfoot Village Family Practice.

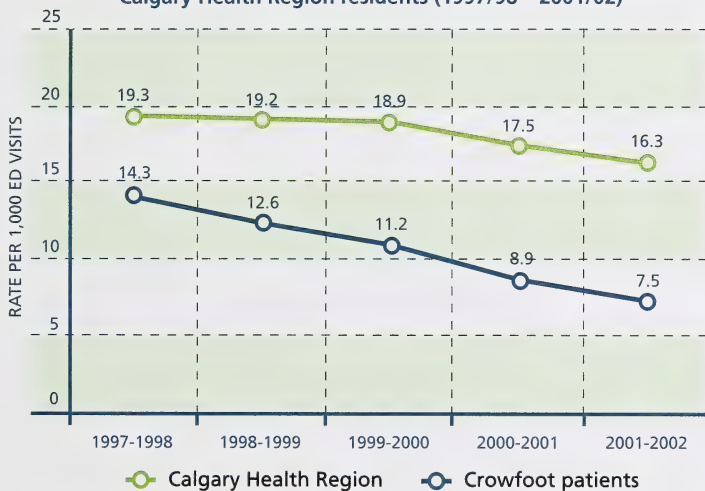
Figure 13: Crowfoot Village Family Practice model under patient-based funding



Source: Crowfoot Experience – Final Report, April 2003

Several process indicators related to clinical screening tests were measured and showed improvement, suggesting that preventative practice was more effective. Similarly, the utilization of ED visits for a common GPSC (upper respiratory tract infection) decreased at a faster rate compared with the rest of the health region (see Figure 14). This suggests more effective management of conditions that otherwise would have resulted in ED visits.

Figure 14: Emergency visits for upper respiratory tract infection among Crowfoot clinic patients compared with Calgary Health Region residents (1997/98 – 2001/02)



Source: Crowfoot Experience – Final Report, April 2003

Greater reliance on clerical and nursing staff to manage some direct services, patient communication, the after-hours help line, and implementation of an electronic health record resulted in overhead cost increases for the Crowfoot clinic in the short term. It was expected over the long term that costs might be reduced through better patient management and outcomes.

As shown in Table 10, Crowfoot Village Family Practice patients require significantly fewer family physician visits than expected for similar urban Calgary patients. This is a desirable outcome given that for Crowfoot:

- Physicians provide more than one service per visit.
- Results and prescription refills are given by telephone when appropriate.
- Telephone appointments are sometimes done for follow up.
- Further required investigations or referrals can be initiated if discussed at a previous visit.
- Clinic nurses work to the full scope of practice and deliver many routine services such as immunizations or injections, dressing changes and suture removals.
- There is nurse telephone triage and advice for self-management of specific conditions.
- Appointments are often not needed for completion of forms and insurance letters.
- Patients have appointments in the clinic with other health professionals for such things as chronic disease management.

Table 10. Visits by Crowfoot family practice roster patients (2006/2007)
(actual versus expected*)

	CROWFOOT POPULATION	FAMILY DOCTOR VISITS			EMERGENCY DEPARTMENT VISITS (discharged home)			EMERGENCY DEPARTMENT VISITS (admitted to hospital)		
		Actual	Expected	Difference (%)	Actual	Expected	Difference (%)	Actual	Expected	Difference (%)
Female	5,562	19,475	27,009	-28	798	972	-18	118	155	-24
Male	4,606	10,811	14,868	-27	775	833	-7	123	135	-9
Total	10,168	30,285	41,876	-28	1,574	1,805	-13	240	290	-17

* Expected utilization is derived from utilization rates for the Calgary metropolitan area census, adjusted by age group and gender.

Source: Health Quality Council of Alberta

Table 10 compares actual and expected utilization of specific services. Actual visits are the real number of visits. Expected visits are the number of visits expected if Crowfoot patients utilized services at the same rate as the Calgary metropolitan area. Table 10 also shows that ED visits by Crowfoot clinic patients are 13% fewer than expected for patients discharged home and 17% fewer than expected for patients who are admitted to hospital.

These combined results suggest better long-term management of health issues and an appropriate reduction in use of ED services (and associated costs).

Primary Care Networks

The experience of the Crowfoot clinic preceded other related initiatives. In 2003, Alberta Health and Wellness, the Alberta Medical Association and Alberta's regional health authorities established the Primary Care Initiative (PCI) to improve access to family physicians and other front-line health care providers in Alberta. The purpose of the PCI is to develop primary care networks (PCNs) and support them in meeting the following objectives:⁴⁷

- Increase the number of Albertans with access to primary care services.
- Manage access to appropriate round-the-clock primary care services.
- Increase the emphasis on health promotion, disease and injury prevention, care of patients with medically complex problems and care of patients with chronic disease.

- Improve coordination of primary health services with other health care services including hospitals, long term care and specialty care services.
- Foster a team approach to providing primary health care.

As of June 2008, there were 26 PCNs operating throughout Alberta with another 10 in the planning stages. As well, more than 50% of all Alberta family physicians now work within a PCN. The goal by 2011 is for 75% of Alberta's family physicians to be part of PCNs. While most physicians in PCNs work on a fee-for-service basis, PCNs are resourced using patient-based funding.

Discussion

When Albertans receive more robust services through PCNs, overcrowding in EDs and urgent care centres may be reduced. PCNs support physicians and their practices with additional resources for patient care. For example, the family physician dedicates time to assess the patient and build a treatment plan that may be implemented by a multi-professional health team. With optimization of time and resources and 24/7 service delivery, these networks can assist their clients in acute events other than injuries, thereby preventing inappropriate ED visits.

The Crowfoot model, using patient-based funding, has additional incentives for better quality treatment starting with the first consultation. This model also

promotes disease prevention, chronic disease management and health promotion utilizing a multi-professional team. Multi-professional teams allow physicians to focus on what they are most highly trained to do while less complex issues are handled appropriately by other professionals.

In the fee-for-service payment model, physicians are paid by the number of patient visits. In this context, appointments and practices are often optimized to address single medical issues in short blocks of time.

Patient-based funding encourages more efficient use of primary health services as the physician has more time to spend with patients on more comprehensive treatment. This has the added benefit of preventing unnecessary additional visits. Avoidance of penalties by keeping enrolled patients from using the services of other family physicians also adds to the system's efficiency.

The basic philosophy of patient-based funding is to shift the power to the patient by keeping the patient healthy based on individual needs and more efficient use of a multi-professional team. The integration of the physician with other professionals is much easier when all have the responsibility and financial consequences for the continuum of care.

2.5 Health Service Utilization: Proportion of seniors with high levels of service utilization for conditions that could be managed in the community

Background

The combination of increasing numbers of seniors, longer life expectancy, and the high prevalence of chronic diseases or conditions among seniors present far-reaching challenges for the health care system. Enabling healthy aging and management of chronic conditions through increased home and community care capacity that focus on health promotion and disease prevention are now widely seen as the means to delay and minimize the severity of chronic diseases and disabilities and to reduce health care costs and the need for long term care services.

More than four out of five Canadian seniors living at home suffer from a chronic health condition.⁴⁸ The most common is arthritis followed by high blood pressure, allergies, back problems, chronic heart problems, cataracts and diabetes. Many Canadian seniors have a long-term disability and the proportion rises sharply to 45% for those 85 and over (21% of those 65-74 years, 28% of those 75-85 years, and 45% of those 85 or over).

Linking System and Clinical Indicators

A reduction in patient use of emergency departments (EDs) and urgent care centres for health conditions better managed in primary care will contribute to a more efficient health system and reduced costs. Reduced crowding in EDs will improve patient access and satisfaction.

Section 1.2 explores health care expenditures at the system level. Section 1.9 reports patient rating of overall access and Section 2.1 explores patient satisfaction with ED care.

Seniors' higher use of some acute care services, such as EDs, is known to be associated with a lack of access to and/or use of appropriate primary care services.⁴⁹

Seniors with multiple diseases and complex needs often require many different services from many different providers and agencies. In such circumstances, problems can arise including care fragmentation, lack of continuity and coordination among health services, duplication in assessing patient needs and the inappropriate use of costly resources.⁵⁰

Evaluations of a number of well-designed and implemented initiatives with integrated delivery systems demonstrate that these problems can be overcome. Examples include the On Loc Senior Health Services in San Francisco (1971-present),⁵¹ numerous initiatives under the U.S. Program of All Inclusive Care for the Elderly (PACE 1986-present),⁵² and in Alberta the CHOICE program in Edmonton and Comprehensive Community Care (C3) in Calgary. Key success factors of effective comprehensive seniors care programs such as these have been studied and published in other jurisdictions.^{53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64}

Consultations with seniors indicate that they want to receive the support and care they require while remaining in their own homes and communities for as long as they are able. Seniors highly value independence and well-being as well as choice and control over how they live their lives. To achieve this, seniors require access to health care services and information about available programs and services and opportunities to stay engaged in the community.^{65, 66, 67, 68}

Indicator Definition

Numerator: Number of persons aged 65 or over with high levels of service utilization defined as four or more hospital admissions in a year, or seven or more emergency department (ED) visits, or 13 or more physician visits annually, with the exception of patients with cancer, burns or in need of renal dialysis.

Denominator: Total number of Albertans aged 65 or over.

What the Data Shows

Table 11 shows that the proportion of high users of health services varies by region of residency from 17% to 27%. The expectation is that this indicator is sensitive to improvement through seniors' community programs with clinical personnel capable of identifying and alleviating signs and symptoms and helping seniors better navigate the health system.

Table 11. Proportion of seniors with high-level service utilization for conditions that could be managed in the community by Alberta health region (2006/07)

HEALTH REGION	NUMBER OF HIGH-USER RESIDENTS (65+)	TOTAL SENIORS (65+)	PROPORTION OF HIGH USERS (%)
Chinook	4,865	21,998	22.1
Palliser	3,543	13,279	26.7
Calgary	27,789	118,796	23.4
David Thompson	6,810	36,841	18.5
East Central	3,219	17,453	18.4
Capital	24,133	117,941	20.5
Aspen	3,450	19,615	17.6
Peace Country*	NA	NA	NA
Northern Lights	416	2,173	19.1
Alberta minus Peace Country	74,225	348,096	21.3

* Missing some inpatient records for Queen Elizabeth II Hospital and some ED records for three other hospitals.

Data source: Alberta—inpatient morbidity, physician claims and ambulatory care data

Analysis: Health Quality Council of Alberta

Examples of Actions for Improvement

Capital Health developed a comprehensive range of community care services for seniors organized in two streams: Home Living and Supportive Living.^{69,70} They were the first to implement a unique program in the Home Living system known as Comprehensive Home Option for Integrated Care of the Elderly or CHOICE. CHOICE is a coordinated care program that works to keep older people healthy and living at home. It provides a full range of medical, social and supportive services including: a day centre, medical monitoring and treatment, medication dispensing, rehabilitation, transportation, 24-hour phone number, and in-home personal care assistance. The program's mandate is to serve seniors with multiple health problems and/or those requiring coordination of their care to remain living at home.

A community care coordinator assesses the clients. The following points are considered when determining eligibility:

- Candidates can be safely cared for at home within the resources of the CHOICE program.
- Candidates have a history of increased utilization of health care services for complex, chronic medical conditions.



Linking System and Clinical Indicators

Emergency department (ED) capacity is significantly impacted by availability of inpatient beds, some of which are utilized by seniors who could be more appropriately served in the community. Appropriate management of seniors' health issues in the community has implications for inpatient and ED access and overall health expenditures.

Section 1.2 explores health care expenditures at the system level and Section 1.9 reports patient rating of overall access.

- Cognitively impaired candidates and those with challenging behaviours can be managed within the resources of CHOICE and do not put staff at risk.
- Candidates and their support network are committed to the candidate staying at home and are willing to accept coordinated care services in partnership with the CHOICE program.
- Candidates will attend the day centre on a regular basis and have the ability to access and use the available transportation as contracted by the CHOICE program.
- Caregivers require the supportive services of the CHOICE program to continue their caregiving role.
- Candidate's potential length of stay in the program is no less than three months.

A review of the CHOICE program published in August 2003 by Capital Health encompassed results for the 146 patients during the 2002 to 2003 fiscal year (CHOICE is in the process of conducting a third review). The 2003 review approach included chart reviews, data from internal sources within Community Care Services as well as from Alberta Health and Wellness.

Results demonstrated the program's value regarding health service utilization:

- Inpatient admissions decreased by 67.4%.
- Inpatient total length of stay decreased by 70%.
- Inpatient ED visits decreased by 62.9%.
- Ambulatory care visits decreased by 70.9%.
- Ambulance trips decreased by 51.5%.
- Home care services decreased by 54.6%.
- Hours of home care services decreased by 60.9%.

C3 and CHOICE are similar programs. Along with the decreased use of urgent care services, these programs enable clients who previously would have been admitted to a long term care facility to remain in their homes.

Discussion

Appropriate use of health services based on client need and evidence-based practice can in turn decrease pressure in other acute sectors of the health system. Comprehensive day programs such as CHOICE and C3 are examples of an effective way to achieve this objective.

Health Quality Dimension: Efficiency

2.6 Technology Evaluation: Proportion of high-cost health technologies evaluated by cost-effectiveness analysis

Background

Are Albertans getting value for money with new drugs and technologies? Alberta and many other health care jurisdictions face three major dilemmas regarding this question:

- How to control constantly increasing cost per capita for health care services (sustainability).
- How to decide when to endorse and fund new drugs and new technologies.
- How to make informed decisions without standardized evaluation criteria to determine the cost-effectiveness of new drugs and technologies.

In 1999, the U.K.'s National Institute for Health and Clinical Excellence (NICE) adopted the incremental cost-effectiveness ratio (ICER) as the common metric for all health technology assessments (HTAs) using a threshold of between £20,000 and £30,000 per quality-adjusted life years (QALY) gained to determine whether a new treatment should be funded. The assessment process involves professional bodies, patient representatives and academics. Generally, new technologies are incorporated with restricted use or with cost-sharing agreements with the pharmaceutical or medical device company.

Since HTAs were introduced, new technologies have increased the National Health Service's overall costs by £1 billion.⁷¹ Without HTAs the increase could have been three times more.

In 2003, Alberta Health and Wellness established a Health Technologies and Services Policy Unit to coordinate development and implementation of the Alberta Health Technologies Decision Process.

In 2004, the Office of Surgical Research of the Calgary Health Region developed a local HTA decision-support program to assist with the evaluation and safe introduction of new technologies into clinical practice. The unique feature of this initiative is the development of HTA capacity at the local level – from the bottom up. The program facilitates the assessment of health technologies in a structured and consistent manner considering clinical safety and efficacy, local infrastructure impacts, budget needs and impacts, and the requirements and availability of trained personnel.

Indicator Definition

Numerator: Number of new high-cost health technologies incorporated after cost-effectiveness analysis.

Denominator: Total number of new high-cost health technologies in Alberta.

What the Data Shows

There is no current data publicly available for the total number of new technologies incorporated in the Alberta health system or for how many were introduced following a cost-effectiveness analysis. Currently there is no consensus or definition of what kind of health technologies should be evaluated.



Examples of Actions for Improvement

Sepsis is a significant health problem. This severe, generalized inflammatory response to an infection constitutes about 2% of hospitalizations.⁷² It results in long hospital stays, high costs and death for 30% of the people who get it.

A promising drug, activated protein C, was tested on 1,690 intensive care patients with severe sepsis in a randomized clinical trial in the United States. The PROWESS study⁷³ concluded that the drug reduced sepsis-related mortality by 20% over 28 days among participants. The cost of this drug, however, is high. When considering the introduction of this drug in an Alberta health region, its cost was estimated to be close to the overall annual intensive care budget for medications or \$1.36 million of a \$1.6 million budget.

The efficacy of this drug and its cost raised questions: Does activated protein C represent good value for the money spent? Would incremental costs be lower if the drug was used only on those who benefit most?

The U.S. Food and Drug Administration published a post-license study concluding that patients who were sickest at baseline had a substantially improved outcome associated with treatment, while there was no impact among patients with a lower acuity of illness. Aware of this study, Dr. B. Manns and his colleagues at the University of Calgary conducted a cost-effectiveness analysis with local intensive care unit (ICU) patients.⁷⁴

The authors investigated the economic efficiency of targeting this drug to two groups: those with severe sepsis (APACHE ≥ 25) and those with a lower acuity of illness (APACHE ≤ 24). The same severity score system used by the U.S. Food and Drug Administration (APACHE II) was adopted. The results are shown in Table 12. The cost per life year gained treating all patients with activated protein C was \$27,936. However, using a severity score, the cost dropped to \$19,723 for the sickest group and rose to \$575,054 for the other.

Table 12. Cost-effectiveness of activated protein C for sepsis patients in Calgary Health Region intensive care units (2001)

PATIENT GROUP	INCREMENTAL GAIN IN LIFE YEARS PER PATIENT	INCREMENTAL COST PER LIFE YEAR GAINED (\$)
All	0.38	27,936
APACHE ≤ 24	0.01	575,054
APACHE ≥ 25	0.76	19,723

Source: An Economic Evaluation of Activated Protein C Treatment for Severe Sepsis, *New England Journal of Medicine* 2002, 347:993–1000

Limiting the use of this new drug to patients with a more severe presentation of the disease, the total 2001 cost of incorporating it was estimated to be \$482,800, an enormous difference compared with the \$1.36 million that could have been spent without a cost-effectiveness analysis. In this particular case, the benefit to the APACHE ≤ 24 group would have been so low and the cost so high that the Calgary Health Region was able to make its policy decision without reservation.

Another calculation using QALY creates a standard for the comparison of different health technologies. Such comparisons are useful for decision-makers evaluating numerous health technology choices for use across the system.

Discussion

To date, the Canadian Agency for Drugs and Technologies in Health (CADTH) has not applied a common efficiency metric to the incorporation of new technologies and has not defined an ICER threshold to be used in the decision-making process. There is also no legislation in any province that obliges the public health system to implement technology respecting the health technology assessments developed by CADTH. For these measurements to become useful for quality improvement projects and to result in a more efficient health system, a standard analysis for cost-effectiveness ratios needs to be adopted for health policy decisions. This is reality in the U.K.⁷⁵ and could be in Canada.

In a publicly funded health system focused on maximizing efficiency, careful assessments of cost and clinical benefit are essential. A cost-effectiveness analysis is one way to simultaneously incorporate the clinical effectiveness and costs of a new treatment or any new intervention with clinical consequences. Cost per QALY gained can be used as the common metric for all efficiency assessments. These tools guide and support informed decision-making and cost accountability.

These calculations should be done using a process capable of reaching the best balance between the introduction of a new technology and the sustainability of the health system. Measuring quality of life as an outcome and monitoring cost/volume for each service that the health system provides is a good start.

Linking System and Clinical Indicators

Systematic and rigorous assessment of cost effectiveness of new technologies and treatments has the potential to impact rising health expenditures.

Sections 1.1 and 1.2 explore health care expenditures at the system level.

Health Quality Dimension: Effectiveness

2.7 Acute Care for AMI: Proportion of patients who died from heart attack within 30 days of hospitalization

Background

A heart attack (acute myocardial infarction or AMI) usually occurs when a blockage in a coronary artery severely restricts or cuts off the blood supply to a region of the heart. If this happens for more than a few minutes, heart tissue dies. This makes the time to accurate diagnosis and appropriate treatment critical to the patient's survival.

AMI accounts for almost half of all deaths related to cardiovascular disease globally. In Canada, AMIs are the leading cause of death and the single largest attributable diagnostic contributor to the economic burden of illness.

Segment elevation myocardial infarction or STEMI represents around 40% of all AMI cases. Despite 20 years of progress in the diagnosis and treatment of STEMI, more deaths occur than are necessary due, in part, to variable and suboptimal implementation of routine recommended clinical practice guidelines.^{76, 77, 78, 79, 80}

The 2004 Guidelines for the Management of Patients with STEMI from the American College of Cardiology and American Heart Association developed in collaboration with the Canadian Cardiovascular Society recommend the following clinical practices:^{81, 82, 83}

- Primary percutaneous coronary intervention (PCI) should be performed as quickly as possible, with a goal of a medical contact-to-balloon or door-to-balloon time of within 90 minutes.
- If the symptom duration is within three hours and the expected door-to-balloon time minus the expected door-to-needle time is: a) within one hour, primary PCI is generally preferred, or b) greater than one hour, fibrinolytic therapy is generally preferred.

Other components of the guidelines related to prescribing aspirin, beta-blocker therapy, an angiotensin converting enzyme inhibitor and low-density lipoprotein cholesterol reducing therapy as well as anti-smoking counselling have been adopted as part of the AMI interventions of the Institute for Healthcare Improvement in the United States and the Safer Healthcare Now! campaign in Canada.

The STEMI initiative in Ottawa reflects the central role played by emergency medical services (EMS) in expediting the care of patients with this diagnosis.^{84, 85} This initiative implemented an EMS referral pathway involving paramedics interpreting pre-hospital electrocardiograms (ECGs) for STEMI detection, referral of patients directly from the field to the Ottawa Heart Institute for primary PCI, paramedic notification of a central page operator of impending patient arrivals, and code activation prompting assembly of the cardiac team in the catheterization laboratory. The initiative achieved door-to-balloon times of less than 90 minutes for 79.7% of patients who were transferred from the field compared to only 11.9% of patients transferred from emergency departments (EDs).

Indicator Definition

Numerator: Number of deaths from heart attack (AMI), adjusted by age and gender, within 30 days of hospitalization.

Denominator: Number of patient admissions to acute care sector due to heart attack.

Figure 15. 30 day in-hospital heart attack mortality rate in Alberta by health region (2004/05 – 2006/07)



Source: Canadian Institute for Health Information – 2008 Health Indicators

What the Data Shows

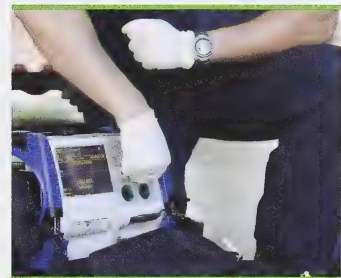
As 40% of all heart attacks are STEMI cases, reducing mortality among these cases will reduce mortality in overall heart attacks. Alberta hospitals as a whole have the lowest risk of death after a heart attack compared with other Canadian provinces. The Calgary and Capital health regions present the lowest levels of death after a heart attack at 7.3% and 7.5% respectively (see Figure 15).

Examples of Actions for Improvement

The Foothills Interventional Cardiology Service has been providing 24-hour cardiac catheterization since 1986. On average, between 300 and 400 patients make use of this service annually.

Within this service, a quality improvement project named STEMI was formally created in 2002. STEMI has been managed by a team with representatives from EMS, ED, Cardiac Catheterization Laboratory, Interventional Cardiology, Coronary Care, Cardiac Wellness Institute of Calgary and family physicians. Their goal is to improve the process of AMI care and reduce mortality after a heart attack.

Between June 2004 and October 2005, 78.8% of patients tracked by the project had restored blood flow in less than 90 minutes from arrival



in the ED.⁸⁶ The in-hospital mortality within 30 days was 3.1%. These patients had their ECG done by EMS paramedics, enabling a pre-hospital diagnosis. The time between arrival at the ED and arrival at the catheterization laboratory had a median time of 32 minutes.

Through 2005 and 2006 the STEMI team made significant progress simplifying AMI care and reducing the time between onset of symptoms (pain) and restored blood flow to the heart (coronary perfusion). This intervention has shown a corresponding decrease in mortality within 30 days after heart attack.

Concurrently, a follow-up STEMI clinic was created to address the early discharge problems listed here:

- Patients' false sense of security about this acute event.
- Need for more patient education about the ongoing management of their condition.
- Inability to access timely follow-up care and cardiac rehabilitation programs.
- Gaps in the communication and coordination of care between cardiologists and family physicians.⁸⁷

As a result, a post-operative model of care was developed by a multidisciplinary team encompassing systematic screening and scheduled patient follow up including the identification of 'red flag patients' requiring further monitoring by the family physician and cardiologist.

Benefits of the STEMI clinic include: a smooth transition between acute and community care; enhanced secondary prevention; monitoring of high-risk patients; and better care and communication among patients, primary physicians and specialists.

A provincewide improvement plan based on the successful experiences of the Calgary and Capital health regions is already under development. The Alberta Cardiac Access Collaborative is implementing the following four initiatives:^{88, 89, 90, 91}

1. **Heart Attack Initiatives** – to improve time to treatment for heart attack patients and adherence to best practice guidelines through a systematic and integrated approach to treating heart attacks and expansion of the reach of early reperfusion programs. The Vital Heart Response Program based in Edmonton is expanding to central and northern Alberta. The Strategic Evaluation of ST Elevation Myocardial Infarctions (STEMI) based in Calgary is expanding to southern Alberta. A key element in both initiatives is wireless transmission of an ECG administered by paramedics and transmitted to physicians who interpret the ECG at a receiving hospital before the patient arrives. In rural areas where there is no EMS system, a similar approach will be used by in-hospital staff connected to a tertiary urban care hospital through the Internet.
2. **Heart Failure Initiatives** – to provide heart failure clinic services that equip patients and families with the tools and knowledge they need to live well with heart failure (all Alberta health regions are participating).
3. **Patient Navigation Initiatives** – to improve access to timely treatment and care by coordinating access to care, triaging patients according to urgency, standardizing referral processes and facilitating the transition of patients between caregivers and service areas.
4. **Arrhythmia Service Initiatives** – to increase patient access to arrhythmia services by opening new clinics in Calgary and Edmonton that provide timely access to cardiac devices, reduce inappropriate referrals through the use of care pathways, and triage patients for general consultation to reduce assessment and investigation time.

Discussion

The implementation of early diagnosis in ambulance and quick access to reperfusion in hospital are examples of successfully applying clinical guidelines and establishing standardized care pathways to improve patient outcomes.

2.8 Primary Care for Chronic Disease: Proportion of persons with coronary artery disease and diabetes that receive treatment services in primary care according to chronic disease management guidelines

Background

The burden of chronic illness is enormous and growing at a significant rate due to a rapidly aging population and the increased longevity of people with chronic conditions. Chronic diseases include cardiovascular disease, diabetes, cancer and chronic lung disease.

These are the largest causes of death and disability worldwide, accounting for 60% of deaths and 45% of the global burden of disease.⁹²

The Canadian health care costs associated with chronic disease become evident with the knowledge that 33% of Canadians with one or more of seven chronic conditions account for approximately 51% of family physician visits, 55% of specialist consults, 66% of nursing consults and 72% of nights spent in a hospital. Chronic disease patients are more frequent users of health care services than most people.⁹³

A relatively small set of known risk factors are responsible for most of the main chronic diseases. Some are lifestyle related such as unhealthy diet, lack of physical activity and tobacco use.⁹⁴ Others are biological factors such as obesity, high levels of cholesterol and hypertension.⁹⁵ According to the World Health Organization and the World Cancer Research Fund, at least 80% of heart disease, stroke and type 2 diabetes, as well as 40% of cancer, could be avoided through healthy diet, regular physical activity and avoidance of tobacco use.⁹⁶

An important characteristic of patients with chronic diseases is that they typically have multiple conditions. Alberta data from 2007 shows that 35% of people with a chronic disease actually have two or more chronic conditions (based on a six-year CRG). As a consequence, it is neither effective nor efficient to

rely on traditional models of care, which are fragmented and unsuitable for patients with complex conditions. Comprehensive and integrated care models are better.

Indicator Definition

Numerator: Number of persons with coronary artery disease and diabetes who have not received treatment services in primary care according to chronic disease management guidelines.

Denominator: Total number of persons with coronary artery disease and diabetes.

What the Data Shows

As can be seen from Table 13, significant numbers and percentages of Albertans with cardiovascular disease and diabetes are estimated to receive suboptimal care. Suboptimal care is measured in terms of the difference between those actually receiving interventions recommended in chronic disease management guidelines and intervention targets, which range from 70% to 90% of the affected patient population. Between 6,300 (7%) and 28,000 (31%) of cardiovascular patients are estimated not to have received recommended treatment interventions. Between 36,500 (26%) and 53,500 (38%) of diabetes patients are estimated not to have received treatment interventions recommended in applicable chronic disease management guidelines.

Over 1,700 complications could be prevented annually, along with the socio-economic effects, if interventions recommended in chronic disease management guidelines were systematically and effectively implemented (see Table 14).

Table 13. Estimate of Albertans with coronary artery disease and diabetes receiving suboptimal care (March 2007)

RECOMMENDED INTERVENTIONS (chronic disease management guidelines)	PATIENTS WHO SHOULD RECEIVE INTERVENTION	ALBERTANS WITH CONDITION ¹	PROPORTION TARGETED TO RECEIVE INTERVENTION ² (%)	ESTIMATED ALBERTANS RECEIVING INTERVENTION ³ (%)	ESTIMATED ALBERTANS NOT RECEIVING INTERVENTION ⁴ (%)	Number
Beta-blocker	Coronary artery disease	90,586	85	54	31	28,062
ACEI/ARB	Coronary artery disease	90,586	85	66	19	17,211
Aspirin	Diabetes	140,674	90	52	38	53,456
	Coronary artery disease	90,586	90	74	16	14,494
Statin	Diabetes	140,674	70	44	26	36,575
	Coronary artery disease	90,586	70	58	12	10,870
Blood pressure control	Diabetes	140,674	75	47	28	39,389
	Coronary artery disease	90,586	75	68	7	6,341
Blood sugar control	Diabetes	140,674	75	48	22	30,948

¹ The number of Albertans with each particular condition was calculated using the following criteria: one patient visit or three or more outpatient visits between 2001/02 and 2006/07 among active patients as of March 2007.

² These recommended intervention targets are based on those found in the Ontario Health Quality Council's *QMonitor: 2008 Report on Ontario's Health System* and associated technical reports.^{97, 98}

³ The estimated percentage of Albertans who receive each recommended intervention is based on baseline information from the Saskatchewan Chronic Disease Management Collaborative. The Calgary CDM initiative has similar numbers for blood sugar (40%) and blood pressure (56%) control among diabetes patients.

⁴ The estimated percentage of Albertans not receiving intervention is the remainder after subtracting the proportion of patients targeted to receive the intervention from the estimated Albertans receiving the intervention.

Source: Health Quality Council of Alberta

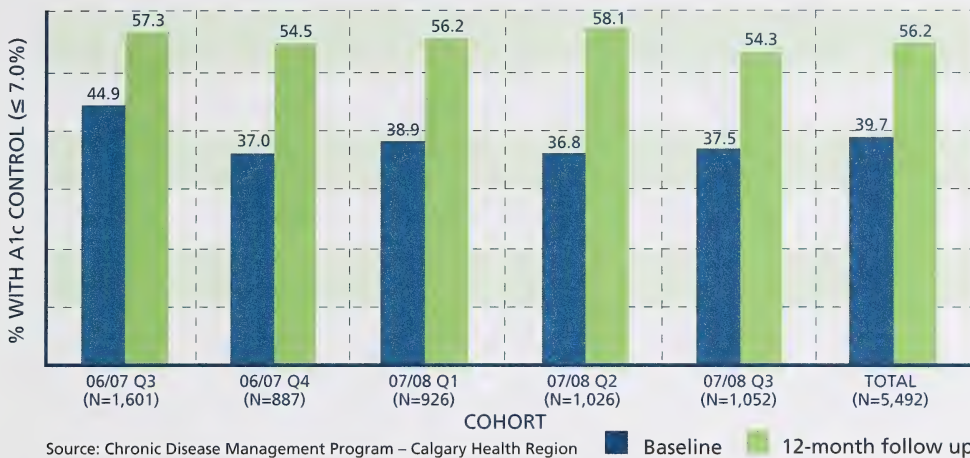
Table 14. Annual estimate* of preventable complications related to chronic disease by use of recommended management interventions in Alberta (2006/07)

RECOMMENDED CHRONIC DISEASE MANAGEMENT INTERVENTIONS	ESTIMATE OF PREVENTABLE COMPLICATIONS RELATED TO CHRONIC DISEASE PER YEAR		
	Heart Attack	Stroke	Amputation
Beta-blocker use	253		
ACEI/ARB use	83	52	
Aspirin use	70	32	
Statin use	381	113	
Blood pressure control	233	166	32
Blood sugar control	284		28
Total	1,304	363	60

* The Ontario Health Quality Council methodology involves calculating the number of patients receiving suboptimal care, identifying the number needed to treat in the literature, and calculating the complications avoided by dividing the number receiving suboptimal care by the number needed to treat.⁹⁹

Source: Health Quality Council of Alberta

Figure 16. Proportion of diabetes patients with blood glucose controlled at baseline and 12 months later for each cohort of enrolled patients for each quarter of a year in the Calgary Health Region Chronic Disease Management Program



Examples of Actions for Improvement

A number of health regions in Alberta have independently developed and implemented chronic disease management initiatives. The following example illustrates some of the improved outcomes achieved by the chronic disease management (CDM) initiative in the Calgary Health Region when various component interventions of the chronic care model were effectively implemented.¹⁰⁰ As of 2008, the CDM initiative had managed over 55,000 patients and involved approximately 200 family physician partners, 10 ambulatory clinic partners, over 30 staff nurses, and about 80 allied health professionals (kinesiologists, occupational therapists, physiotherapists, social workers and dietitians).

Figure 16 shows the percentage of program participants within the different groups of diabetic patients (cohorts) with blood glucose levels controlled. It shows there were important improvements in the number of people who had these levels controlled after one year of follow up.

Figure 17 shows the 12-month history of emergency department (ED) admissions per 1,000 patients for those enrolled in the CDM program (aggregated by quarter). As anticipated by the findings from other chronic disease management programs,^{101, 102, 103}

a significant decline in ED admissions was achieved through the provision of improved chronic disease care at the primary care level.

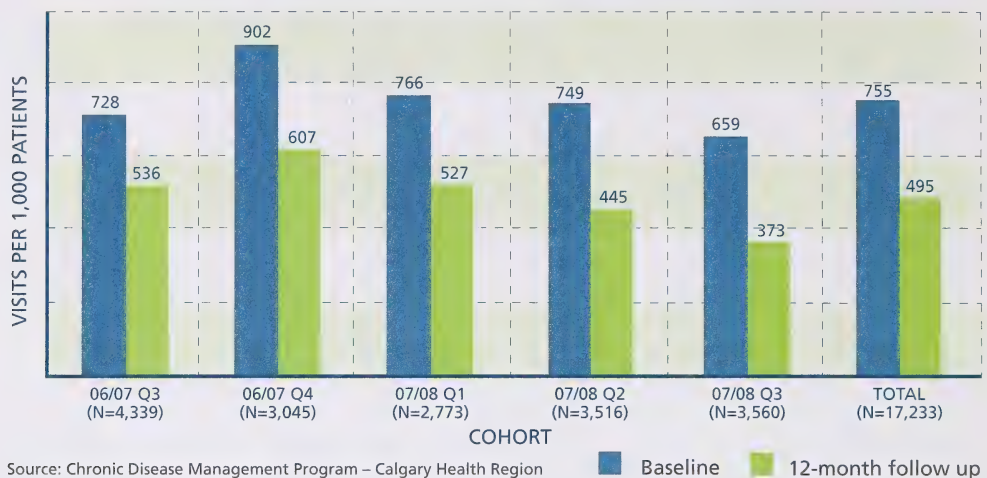
The CDM initiative did a baseline study with enrolled patients at their second visit. The tool used to evaluate patient satisfaction was based on the program Improving Chronic Illness Care developed and validated to monitor the implementation of their improvement model.¹⁰⁴

They asked patients questions related to:

- Patient activation: soliciting patient input involvement
- Decision support: providing information to patients to enhance understanding of care
- Goal setting: setting specific collaborative goals
- Problem solving: considering potential barriers (social and cultural) in making treatment plans
- Follow up: proactive contact to assess progress and coordinate care

The CDM initiative and the Primary Care Initiative (a new Alberta initiative to improve access to family physicians working in a multi-professional team) are working together to spread evidence-based chronic disease management practices across the province while adopting the same performance measures.

Figure 17. Proportion of diabetes patients with previous emergency department visits at baseline and 12 months later for each cohort of enrolled patients for each quarter of a year in the Calgary Health Region Chronic Disease Management Program



Linking System and Clinical Indicators

A majority of direct health care costs are attributable to individuals with chronic diseases; however, this group represents only a minority of the Alberta population. The proportion of individuals with chronic disease is increasing. Effective management of chronic disease in the community is a priority.

Sections 1.3 and 1.5 explore costs attributable to chronic disease.

Discussion

Redesigned primary care delivery mechanisms incorporating chronic disease management practices provide the continuity, coordination, comprehensiveness and care of the whole person essential to effective chronic disease care. The continuity of care characteristic of these types of primary care models is associated with a greater use of preventive services, reductions in hospitalizations and declines in overall health costs.

2.9 Long Term Care: Proportion of long term care facilities using the interRAI Long Term Care Facility Resident Assessment Instrument for resident assessment and care planning

Background

A collaborative network of researchers in over 30 countries joined efforts through a project called interRAI to improve health care for the elderly, frail or disabled.¹⁰⁵ Its goal is to promote evidence-based clinical practice and policy decisions through the collection and interpretation of high-quality data about the characteristics and outcomes of people served across a variety of health and social service settings. Although each assessment instrument in the interRAI family of tools and applications was developed for a particular population, they were designed as an integrated health information system.

Integrated standardized tools facilitate the transfer of information across the continuum of care (home care to long term care) based on a core set of assessment items. Common indicators and patient assessment processes enable providers to plan and integrate care and support for each individual as they move between different care settings. Comprehensive patient assessment is the foundation for effective care planning at the front line. Regular patient assessments provide caregivers with the means to follow patient progress and track outcomes. Aggregation of this data at the site, regional and provincial levels allows managers throughout the health system to track improvement initiative progress. Such information can yield important findings about best practices and what works to improve an individual's quality of care.

Indicator Definition

Numerator: Number of long term care facilities using the interRAI Long Term Care Facility Resident Assessment Instrument (LTCF) for resident assessment and care planning.

Denominator: Total number of long term care facilities in Alberta.

What the Data Shows

There is no data publicly available regarding the proportion of long term care facilities using the interRAI LTCF for resident assessment and care planning by health region. The only information currently available is from the Chinook Health Region where, by October 2008, all 11 regional facilities had implemented the interRAI assessment tool.

Examples of Actions for Improvement

The interRAI LTCF is a comprehensive, standardized method for assessing the needs, strengths and preferences of those in chronic care and nursing

home settings. It applies to individual resident care and quality improvement at the facility level.

A form and item-by-item instructions guide health care providers through the assessment of key domains of function, mental and physical health, social support and service use. Data is entered into an electronic health record that then guides the planning of individual resident care issues using embedded evidence-based care planning protocols (clinical guidelines). Clinical assessment protocols, known as CAPs, help the assessor interpret all of the recorded information systematically. CAPs are not intended to automate care planning; rather, they help staff focus on important issues identified during assessment so appropriate intervention decisions can be explored including the option of not intervening. Experts developed and continue to validate each CAP through clinical focus groups and ongoing empirical research.

Alberta's Chinook Health Region adopted the interRAI tool set in 2000. Work began on a project basis and resulted in the strategic approval of the LTCF assessment tool to guide care planning for all long term care residents in 2002. Similarly, use of the home care assessment tool began in 2001. Potentially reversible conditions such as initial delirium, dehydration and restraint use were identified as priorities to introduce the concept of case management. Full implementation followed in 2002/03. In 2004, links to 21 additional interRAI best practice protocols for common and important resident issues were established. By 2007, the Chinook Health Region had moved to a fully electronic documentation and care planning system using interRAI.

Each detailed interRAI assessment protocol includes an outcome scale for the target problem that can be used to monitor resident progress and assist in communication with the physician. Residents are assessed upon admission and then yearly, with partial

reassessments completed quarterly for priority issues. One output of the quarterly reassessments is a quality indicator report with aggregate data on resident outcomes reported by facility.

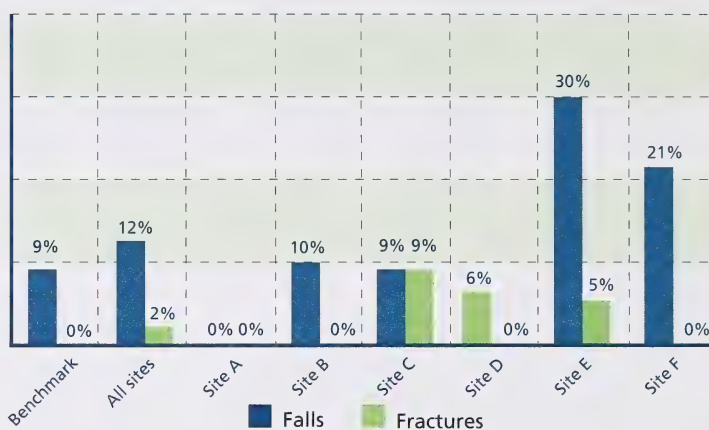
The interRAI indicators that are monitored on the Chinook Health Region quality indicator report cover the following domains of care:

- Accidents
- Clinical management
- Psychotropic drug use
- Skin care
- Infection control
- Behavioural and emotional patterns
- Cognitive patterns
- Elimination and continence
- Nutrition and feeding
- Physical functioning
- Quality of life

The information provided in the report illustrates the outcome, benchmark, reporting threshold and outcomes at multiple levels. Facility, organizational and regional results are monitored facilitating comparison and targeting of improvement efforts. Benchmark values are set internally by the managers at the regional level based on current priorities and realistic performance expectations and may be adjusted periodically.

Figure 18 illustrates how facility-based outcome data can be presented to facilitate comparison and continuous learning by facility and regional managers. This example refers to two related outcomes – falls and fractures, which are captured in the Accidents domain. Regular meetings of facility and regional managers enable sharing of best practices and processes to achieve and maintain high levels of performance and client outcomes.

Figure 18. Prevalence of falls and incidence of fractures by long term care site (Chinook Health Region, 2008)



Source: Chinook Health Region – Long Term Care Services

Providing interRAI outcome data to management and front-line providers on an ongoing basis helps to continuously improve processes of care at both the resident and facility level. Users in the Chinook Health Region confirm that interRAI is a living resident care and quality improvement tool.

One of Chinook Health Region's successes implementing the interRAI assessment tool was introducing it as the primary resident assessment instrument across its long term care sector rather than imposing it as a secondary system on top of what was already in use. Chinook Health Region changed its business processes related to resident care to use the interRAI tool to its full potential.

Another successful major intervention involved a change in accountability for resident care from a work-shift and area-based focus to a client-based case management system with 24-hour client responsibility assigned to one staff member, independent of the direct provision of care. The current goal is to evolve case management across the continuum of care by encouraging case managers to keep track of their residents regardless of

care setting. This change will allow proactive thinking about how levels of care in different settings affect the client's care needs when they return to their original residence.

Discussion

An interRAI LTCF resident assessment and care planning instrument and data system with clinical guidelines attached should be implemented in all Alberta long term care facilities. Since 2007, Alberta Health and Wellness has been working with health regions across the province to implement the interRAI LTCF instrument throughout long term care facilities.

The interRAI tool set is an important quality improvement resource that can also support planning and bed allocations in continuing care. From the point of view of planning, data from the interRAI tools could be used to rationalize the number of beds/space required for long term care, home care and assisted living programs. In addition, data from interRAI could be used in care conferences facilitating family engagement. After the interRAI tool has been fully implemented across the province, frequency of reassessment of long term care residents should be monitored on an ongoing basis.



2.10 Cancer Screening: Proportion of adults aged 50 to 74, not at high risk, screened for colorectal cancer by fecal occult blood test in the last two years

Background

Colorectal cancer is the second leading cause of death from cancer and the third most commonly diagnosed cancer in Alberta. For example, there are twice as many deaths from colorectal cancer as from breast cancer and 12 times as many deaths from colorectal cancer as from cervical cancer, both of which have established population screening programs.^{106, 107, 108} In Alberta, the lifetime risk of developing colorectal cancer is one in 14 for men and one in 17 for women. In 2007, an estimated 1,670 Albertans were diagnosed with colorectal cancer and 610 died from it.

Alberta's growing and aging population has contributed to increases in the absolute numbers of new colorectal cancer cases and related deaths in both men and women.¹⁰⁹ The age-standardized colorectal cancer incidence rates for Albertans traditionally have been lower than the national average for both men and women. However, in recent years Alberta's age-standardized rates have begun to approach the national rates and overall Alberta colorectal cancer rates appear to be increasing. The reasons for this trend are currently unclear.

Colorectal cancer is a malignant tumour that starts in the bowel and is confined locally for a relatively long period before spreading through the bowel wall and into other parts of the body. The risk of bowel cancer increases from the age of 40 years onwards, rising sharply from the age of 50.¹¹⁰ A particular feature of colorectal cancer is that few, if any, symptoms are exhibited until the cancer has reached a relatively advanced stage. However, death can be prevented and survival rates can significantly improve in cases where the disease is treated early.¹¹¹ Lack of early warning symptoms makes regular screening especially important for early detection. Detected early, the success rate for treatment is greater than 90%. If detected at an advanced stage, the five-year survival rate drops to less than 10%. Screening can also be preventative when pre-cancerous lesions (polyps) are identified and removed through colonoscopy before they become cancerous.

Population screening for colorectal cancer has been recommended by the Canadian Task Force on Preventive Health Care since 2001. In 2006, the National Cancer Institute of Canada reported that an estimated 17% reduction in colorectal cancer mortality could be achieved if 70% of Canadians aged 50 to 74 years had a biennial fecal occult blood test (FOBT).¹¹² Unfortunately, screening rates in Canada and in Alberta are far below this level. An analysis of the 2003 Canadian Community Health Survey findings revealed that only 17.6% of respondents from B.C., Saskatchewan, Ontario and Newfoundland and Labrador aged 50 years and older reported having up-to-date colorectal screening and only 23.5% reported any history of colorectal cancer screening (this question was not included in the Alberta survey).¹¹³

Research and debate continues about the optimal screening test and various clinical practice guidelines have been issued by cancer organizations and/or

medical specialties recommending different screening and treatment strategies.^{114, 115, 116} The strategies range from using non-invasive low-cost colorectal cancer screening tests to invasive high-cost procedures to find polyps and cancer. The tests vary considerably in their performance with respect to specificity and sensitivity, intervals between testing, compliance rates, acceptability, risk, cost-effectiveness and strength of scientific evidence.

The choice of screening test is important because for population-based colorectal screening to be cost effective, the proportion of false-positive results needs to be kept to a minimum to avoid the need for additional tests and unnecessary and expensive follow-up treatment such as colonoscopies. As a result, selection of a screening test for large-scale population-based colorectal cancer screening programs requires judicious consideration of the strength of evidence regarding the benefits and risks of various tests. While it is recognized that the FOBT is not 100% accurate, current evidence from randomized controlled trials are strongest in support of FOBT as a screening test for colorectal cancer.^{117, 118, 119, 120}

In light of such evidence, jurisdictions such as the U.K., Australia, France, Italy, Finland and Israel have implemented organized population-based colorectal screening programs using FOBT as the screening method.

A multi-site colorectal cancer screening pilot began in England and Scotland in 2000. The 2003 evaluation of the U.K. pilot reported the following:^{121, 122}

- Colorectal screening using FOBT within the National Health Service is viable and there is abundant evidence that it can have a major impact on mortality from colorectal cancer.
- Uptake of colorectal screening was close to 60%.
- The majority of FOBT positives came from repeat testing, first as weak-positives and then following completion of at least one dietary restricted re-test. Consideration of tests such as an immunological FOBT is strongly recommended to provide more definitive results on the first round of screening.

- FOBT screening is a cost-effective intervention.
- Uptake of colonoscopy among people with a positive FOBT was 87%. There were very few adverse incidents and perforation rates compared with those in published literature. This is attributed to the rigorous quality assurance procedures that were in place.
- The pilot led to increased demand for symptomatic colonoscopy services as well as increased workload for pathology, radiology, oncology and at least initial increases in the surgeries required.

Indicator Definition

Numerator: Number of adults 50 to 74 years old, not high-risk, screened for colorectal cancer by FOBT in the last two years.

Denominator: Total number of adults 50 to 74 years old in Alberta.

What the Data Shows

In 2004, fewer than 12% of Albertans aged 50 to 74 (not high risk for colorectal cancer) were screened for colorectal cancer by FOBT within the last two years. Preliminary results from the first year of the Alberta Colorectal Cancer Screening Program (2008) suggest that progress is being made. Approximately 20% of the target population has now been screened by FOBT within the last two years.

Examples of Actions for Improvement

The Alberta Colorectal Cancer Screening Program aims to save lives by improving the prevention and early detection of colorectal cancer. The program is coordinated by the Alberta Cancer Board and is funded by Alberta Health and Wellness. It is being rolled out in stages across Alberta between 2007 and 2012. The program recommends a stepped approach to screening that starts with an annual FOBT for Albertans aged 50 to 74 at average risk. If there is an abnormal FOBT

result, colonoscopy is recommended as a follow-up test to determine the source of bleeding. Of those who undergo FOBT screening, about 2% will have an abnormal result, and of those approximately 10% will be diagnosed with colorectal cancer.

The program seeks to increase screening rates in the target population to 20% in the first year, followed by a 10% increase (absolute increase) each year in the next four years. One major program strategy is a social marketing campaign directed to health care providers and the public.

Discussion

Screening is important to reduce both mortality and the number of new cancer cases. The Alberta Colorectal Cancer Screening Program believes the best approach to population-based screening is an annual FOBT, followed by a referral to more invasive tests (colonoscopy) for those with a positive result to confirm the diagnosis. A central intake process can manage access to colonoscopy for the FOBT positives. FOBT is a non-invasive and cheap technology. The food restrictions required previous to the exam are exaggerated by the manufacturer of the test and a recent review of the issue identified that only vitamin C intake of more than 250 mg/day has been proven to interfere with the results.¹²³ Nowadays with proper technology and training of lab personnel there is no need for food restrictions prior to the test.

Other provinces (Manitoba and Ontario and soon many others) are also recommending the FOBT as the only screening modality for average at-risk populations in their colorectal cancer screening programs. If the FOBT is repeated annually, the chance of an early diagnosis of colorectal cancer increases.

2.11 Perinatal Care: Incidence of stillbirths and deaths in the first seven days of life among babies born with a birth weight between 1,000 and 2,499 grams

Background

The proportion of Alberta babies born with low birth weight and prematurity increased from 6.2% to 7.0% and from 7.3% to 8.9% respectively between 1997 and 2006.¹²⁴ Babies born too small and too soon are at higher risk for perinatal mortality and morbidity. Many social and behavioural risk factors determine low birth weight and premature delivery. Nonetheless, quality improvement initiatives show that appropriate clinical care can decrease the mortality associated with these conditions.

Perinatal mortality includes deaths in the first seven days of life plus stillbirths. Accurate data on stillbirth in Alberta is only available from 1998 (Alberta Perinatal Health Program) while neonatal mortality, or death in the first 28 days of life, information dates back to 1983. Therefore, neonatal mortality data was used to determine the range of birth weights to examine the same trend as perinatal mortality.

In Alberta, the neonatal mortality for babies at or above 2,500 grams varies between 0.5 and one per thousand births. For the following birth weight groups: 1,000-1,499 grams, 1,500-1,999 grams and 2,000-2,499 grams, neonatal mortality varies between 10 and 40 per thousand births. These differences

in magnitude make the mortality in these lower birth weight groups more sensitive to changes in obstetric and neonatal clinical care than those weighing 2,500 grams or more.

On the other hand, mortality in the 500–999 grams birth weight group is very common at between 200 and 400 per thousand births. In the last 10 years, mortality for this birth weight group has not decreased and it was not included in the indicator calculation.

The neonatal mortality among babies born at less than 1,000 grams would probably not respond to improvements in obstetrical and neonatal care while the neonatal mortality among those born between 1,000 and 2,499 grams could, making it a good quality indicator and the one used here.

Indicator Definition

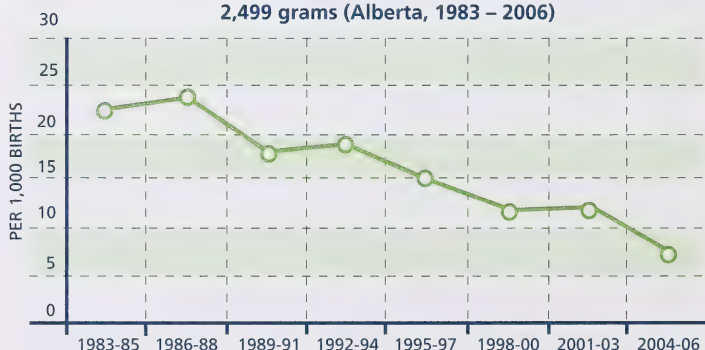
Numerator: Number of stillbirths and deaths in the first seven days of life among babies born between 1,000 grams and 2,499 grams.

Denominator: Total number of stillbirths and live births for babies born between 1,000 grams and 2,499 grams.

What the Data Shows

Decrease in mortality is the major goal of obstetric and neonatal clinical care. Figure 19 shows the neonatal mortality aggregate for three-year periods for the birth weight group between 1,000 and 2,499 grams. Neonatal mortality has decreased in the last 24 years in Alberta.

Figure 19. Neonatal mortality: Babies between 1,000 and 2,499 grams (Alberta, 1983 – 2006)



Data source: Vital Statistics Birth and Mortality Files
Analysis: Health Quality Council of Alberta

Figure 20 shows perinatal mortality from 1998 to 2006. Note that the rate decreased to 25 per thousand births in 2006 and prior to that the rate fluctuated between 30 and 40. If the 2007 rate remains around 25 or below, this will be a good indication that evidence-based intra-partum and neonatal care increases survival and enhances patient outcomes. Increased access to early prenatal care also supports the optimization of pregnant women's health and allows babies to grow appropriately for their gestational age.



Figure 20. Perinatal mortality: Babies between 1,000 and 2,499 grams (Alberta, 1998 – 2006)



Data source: Alberta Perinatal Health Program

Analysis: Health Quality Council of Alberta

Examples of Actions for Improvement

The Managing Obstetrical Risk Efficiently Program (MORE^{OB}) is a patient safety program developed by the Society of Obstetricians and Gynaecologists of Canada. Alberta initiated the program provincially in 2004. Delivered by local obstetric teams, the program focuses on adapting best obstetric care practices to the specific hospital environment.¹²⁵ There is a high correlation between better clinical practices at the moment of delivery and neonatal mortality. The implementation of MORE^{OB} was led provincewide by the Alberta Perinatal Health Program. As of April 2008, staff and clinicians in 61 hospital sites across the nine health regions were participating in the program. Several have completed the three modules of training.

The 12 MORE^{OB} tools for health providers include:

1. An annual scan of the program environment stressing patient safety through practice improvements.
2. Interactive online access to clinical content, case studies and audit tools, and suggested reading to enhance the local knowledge base.



3. Annual workshops and education days to consolidate knowledge, encourage team building and help build communities of practice.
4. An online annual culture assessment survey to enable teams to identify patient safety strengths and opportunities for improvement.
5. Skill drills to learn techniques through hands-on experience and to recognize and anticipate problems.
6. Emergency drills and repeat practice dealing effectively with the most common obstetrical emergencies.
7. An online event tracking and review tool to identify and report near misses and incidents and to organize for multidisciplinary root cause analysis.
8. Case analysis reviews tool kit to identify basic or causal factors that underly variations in performance including sentinel events through root cause analysis and to identify changes that could be made in systems to prevent future harm events.
9. Failure mode and effect analysis tool to examine routine procedures and processes to anticipate potential trouble points and proactively repair them.
10. Audit tools that can be downloaded to assess knowledge of each learning module.
11. Team fitness analysis and building instrument to analyze team performance and to become more effective and efficient in implementing the program.
12. Communication and teamwork tools to improve inter-professional communication and team functions.

The introduction of this quality improvement initiative is an effort to continue to reduce neonatal mortality. Assessment of outcome measures will be possible when all sites have completed module 3 and data for each site becomes available. An evaluation of module 1 (100% of sites) shows a statistically significant decrease in induced labours and episiotomies.¹²⁶ During the implementation of MORE^{OB}, the percentage of higher risk births (vaginal breech delivery, multiple gestations and pre-terms) decreased in level 1 hospitals and increased in level III tertiary care centres, which is evidence of better referral practices.

Discussion

This is a well-designed program that supports provision of a high standard of care. It has been implemented in maternity units throughout the province and in many hospitals in Canada. It is an example of a comprehensive intervention in quality improvement with supporting training and evaluation components for health care providers. This model has the potential to be adapted for other clinical areas.

Health Quality Dimension: Safety

2.12 Intensive Care Units: Proportion of ventilator-assisted patients in intensive care units in compliance with the ventilator-associated pneumonia care bundle

Background

Ventilator-associated pneumonia or VAP is defined as an airways infection that develops more than 48 hours after a patient is intubated. VAP develops in 10 to 20% of mechanically ventilated patients. VAP prolongs the time patients spend on the ventilator, the length of stay in intensive care units (ICUs), and the length of stay in hospital. Hospital mortality of ventilated patients who develop VAP is high – 46% compared with 32% for ventilated patients without VAP. Yet VAP is one of the most preventable hospital infections in the ICU.

Since 2004, international organizations have been publishing guidelines recommending groups of practices or bundles to prevent and manage VAP. These guidelines comprise evidence-based best practices that when used concurrently have been shown to decrease the incidence of VAP.^{127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137} The four components of such VAP bundles are:

1. Elevate the head of the patient's bed between 30 and 45 degrees to decrease the risk of aspiration and improve the patient's ventilation.
2. Interrupt or lighten sedative-drug infusions daily (sedation vacations) at an appropriate time and assess patient for neurological readiness to extubate.
3. Use oral (endotracheal and orogastric) tubes rather than nasal (nasotracheal and nasogastric) tubes for access to the trachea or stomach.
4. Use specially designed endotracheal tubes, called EVAC tubes, for the drainage of subglottic secretions. These EVAC tubes contain a separate dorsal lumen that opens into the subglottic region.

The key outcome measure used to determine the effectiveness of changes is the incidence of VAP expressed by the number of VAPs per 1,000 ventilator days. The key process measure is the overall compliance with the VAP bundle.

Indicator Definition

Numerator: Number of ventilator-assisted patients in ICUs with compliance with the VAP bundle.

Denominator: Total number of ventilated patients in ICUs.



What the Data Shows

Safer Healthcare Now! (SHN) is a campaign aimed at improving the safety of patient care in Canada through learning, sharing and implementing interventions that are known to reduce avoidable adverse events. The goal of the SHN VAP intervention is to implement the 'VAP bundle' of practices to prevent VAP infections and deaths. There were eight Alberta ICU teams from seven different health regions engaged in this campaign in June 2008. Figure 21 shows constant improvement towards the goal of 95% compliance among these participants.

Figure 21. Compliance with VAP bundle
(October 2005 to June 2008; eight Alberta teams/seven organizations)



Source: Safer Healthcare Now! Campaign – Western Node

Examples of Actions for Improvement

The Calgary Health Region has three adult ICUs admitting over 3,000 patients per year. Between 1998 and 2002, the region's Department of Critical Care Medicine (DCCM) found a significant incidence of VAP in its ICUs – 19 cases per 1,000 ventilator days. The related increase in ICU length of stay was about 10 days per patient with VAP. At approximately \$3,000 per ICU day, the added direct cost to the system was roughly \$30,000 for a single case of VAP and \$570,000 for the 19 cases.

In response, the DCCM took important actions:

- **1998** – conducted a systematic review of the literature and, based on the findings, modified existing policies, procedures and guidelines related to aspects of the care of ventilated patients.
- **2002** – adopted a patient safety and quality improvement focus and initiated a VAP bundle based on its participation in the Institute for Healthcare Improvement's Project Impact.
- **2004** – formed three regional multidisciplinary teams to work on VAP, sepsis and blood conservation

initiatives as part of DCCM's participation in the Canadian Collaborative on Improving Patient Care and Safety in the ICU. The DCCM implemented a revised VAP bundle more directly related to the prevention of VAP. A VAP team was put together across the region's three ICUs and included intensivists, registered nurses, respiratory therapists, infection prevention and control practitioners, physiotherapists, a respiratory therapy manager, an intensivist with infectious disease training, an information technology manager and a quality improvement and patient safety leader.

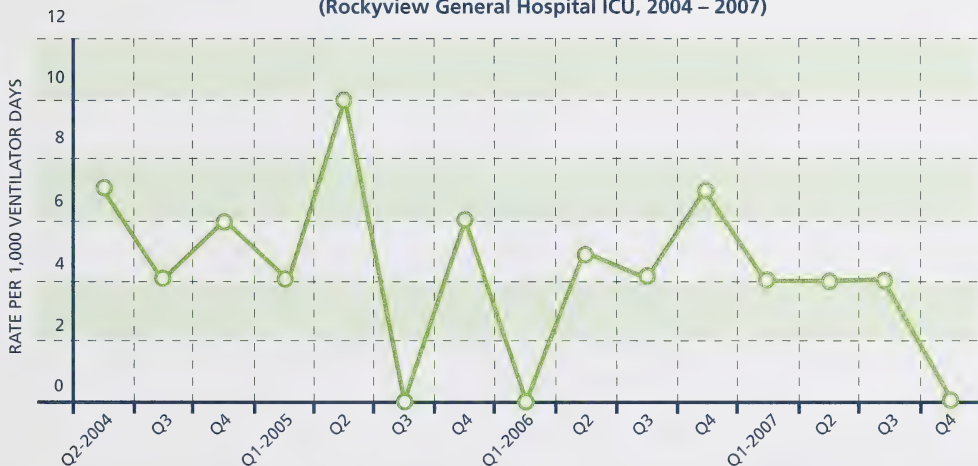
- **2005** – initiated participation in the SHN campaign, adopting its VAP bundle of evidence-based best practices and measures. Targets were set for ICU-specific VAP rates per 1,000 ventilation days aiming at 95% compliance with all components of the VAP bundle at each ICU.

The DCCM team has developed a Quality Indicators Report for both the region and each ICU site including VAP rate, VAP cases, and compliance with the VAP bundle. Compliance with the VAP bundle is monitored

and a performance report reviewed every quarter by the DCCM's Quality and Safety Improvement Council and the site quality committees. As well, every death or adverse event in the ICU is reviewed in morbidity and mortality rounds. After an opening discussion of the review, the ICU team identifies opportunities for improvement and a case report is generated with an action plan.

Figure 22 shows the VAP rate for the ICU at the Rockyview General Hospital from the second quarter of 2004 to the fourth quarter of 2007. Three out of 15 quarters achieved a VAP rate of zero. Six out of 15 quarters had rates above the target level of 4/1,000 ventilator days. Though not shown, similar rates were achieved at the Peter Lougheed Centre and Foothills Medical Centre.

Figure 22. Infection rate of ventilator-associated pneumonia (Rockyview General Hospital ICU, 2004 – 2007)



Source: Calgary Health Region: Department of Critical Care Medicine, Physician Annual Report, January 2007– March 2008

Discussion

The ICUs in the Calgary Health Region introduced the bundle from the SHN campaign among other safety initiatives. Consequently, the ICUs have demonstrated they can reduce VAP rates to zero. The existence of local feedback mechanisms to identify, review and act on all adverse events represents a positive shift in the safety culture and is an example of a continuous learning process.

Linking System and Clinical Indicators

Section 1.10 reports on patient experience of unexpected harm while receiving health care services. Fifty per cent (50%) of reported unexpected harm in 2008 occurred in acute care settings.

2.13 Surgical Procedures: Proportion of patients receiving appropriate prophylactic antibiotics prior to surgery

Background

Surgical site infections (SSI) are one of the most frequent adverse occurrences in hospital patients. Research shows that these infections increase mortality, readmission rates, length of stay and health system costs.

A review of the literature shows that the following care components reduce the incidence of SSI:¹³⁸

- timely administration of prophylactic antibiotic
- timely discontinuation of prophylactic antibiotic
- appropriate selection of prophylactic antibiotic
- appropriate surgical site hair removal
- post-operative serum glucose controlled for major cardiac surgical patients
- maintenance of normothermia in post-surgical care of colorectal or open abdominal surgical patients

If implemented concurrently and reliably, these components can drastically reduce the incidence of SSI.

Indicator Definition

Numerator: Number of clean wound surgical patients with antibiotic administration within 60 minutes of surgical incision.

Denominator: Total number of patients who had a specific in-hospital clean wound surgical procedure.

What the Data Shows

As of July 2008 in Alberta, there were 14 teams (defined as a unique team for each surgical procedure in hospitals) voluntarily submitting data to the western node of the Safer Healthcare Now! (SHN) campaign for SSI. Twelve teams submitted data regarding timely prophylactic antibiotic administration and nine submitted data regarding the use of appropriate antibiotic consistent with the clinical guidelines. Only one team submitted data regarding timely discontinuation of prophylactic antibiotic and none submitted data regarding the outcome or rate of infection in patients undergoing clean surgery. There is currently no system in place to measure SSI after 30 days in Alberta.

Figure 23 shows constant improvement toward the goal of 95% of timely administration of prophylactic antibiotic among the teams engaged in the SHN campaign.

Figure 23. Surgical site infection: Proportion of patients receiving timely antibiotic (October 2005 to December 2007; 12 Alberta teams/seven organizations)



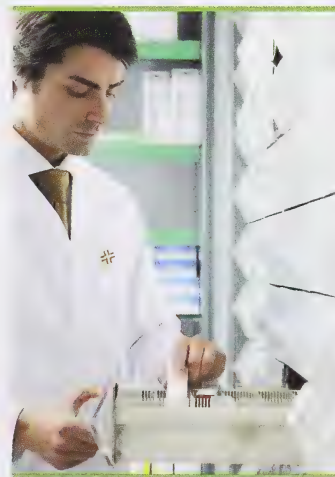
Source: Safer Healthcare Now! Campaign – Western Node

Examples of Actions for Improvement

An example from the David Thompson Health Region (DTHR) illustrates the successes and difficulties of implementing such actions. A committee involving the medical officer of health and the manager of infectious diseases developed a plan to implement the SHN SSI initiative. Three hospitals were identified and the scope was initially limited to two surgical procedures – caesarian section and cholecystectomy. The intent was to move towards an environment free of SSI.

The team first worked with the infection control program and developed a surveillance protocol to establish a baseline measure for SSI. This included chart reviews and post-op follow-up reviews with the patients. The next step was to identify a physician champion. With the help of the team they implemented three initiatives: normothermia, clipping instead of shaving for hair removal, and prescribing antibiotics according to best practices and with appropriate timing of prophylactic antibiotics (administration within 60 minutes prior to surgical incision – measured from antibiotic start time to surgical start time).

The biggest challenge was to work with the pharmacy department, nursing and information systems to ensure the antibiotics were at the right place



Linking System and Clinical Indicators

Section 1.10 reports on patient experience of unexpected harm while receiving health care services.

to meet the 60 minute pre-operative window. The anesthesia department was a key player in assisting with this process. DTHR found that if the antibiotic was ordered by the anesthesiologist in the operating room (OR) pre-operatively, this was the most reliable process for ensuring the antibiotic was administered immediately prior to the procedure.

By working together, the nurses, quality improvement team and the care units providing pre- and post-operative care quickly achieved the goal of clipping for hair removal for any surgery by eliminating the presence of shavers in the OR and on the units. In working with the OR, maintenance and postoperative recovery room staff, they began a lengthy process of changing the temperature in the OR theatres to 20° Celsius (C). The staff in the pre-admission clinic and pre-op nursing units also instructed patients to wear socks to the OR. This practice has been applied to all pre-op patients across the region. Maintaining 20°C in the OR theatres has been a challenge due to required changes to the building systems. There has been improvement but it continues to be a work in progress in aging buildings.

One year later (April 2007), a follow-up survey in the same three hospitals showed a decrease in infection rates. Currently the region is involving all surgeons to establish standing order protocols that would standardize timely antibiotic prophylaxis.

Discussion

This very important patient safety intervention depends mainly on the voluntary commitment of teams to best practice protocols. Without full participation of an organization's physicians and senior leadership, many of these interventions cannot be implemented or standardized across the organization. An annual, provincewide surveillance of SSI with reports to provide feedback to health care providers would help make prevention a more relevant issue.

2.14 Prevention of Antibiotic-resistant Organisms: Incidence of health care associated infections by Methicillin Resistant *Staphylococcus Aureus* (MRSA)

Background

A microorganism that has developed resistance to several antimicrobial agents is of special clinical or epidemiological significance. MRSA are strains of *Staphylococcus aureus* bacteria resistant to antibiotics such as methicillin, oxacillin, penicillins, carbapenems and cephalosporins. MRSA is an indicator of many antibiotic resistant organisms (ARO). AROs are caused by inappropriate use of antibiotics on patients and animals in past decades.

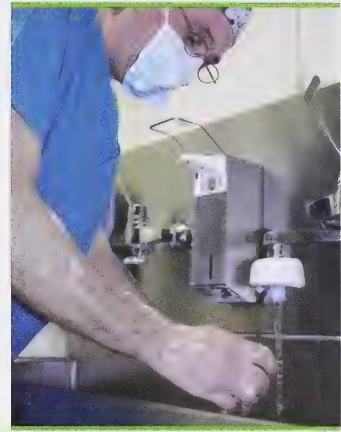
In the U.S, the Centers for Disease Prevention and Control surveillance data have shown high numbers of MRSA in hospitals since 1982 and of vancomycin resistant enterococcus (VRE) since 1990.¹³⁹ *C. difficile* was the next antibiotic resistant organism to appear in hospitals in significant numbers with others such as *Acinetobacter baumannii*, *Klebsiella* and *Pseudomonas* now emerging. These infections cause delays in hospital discharges, increase costs, and put patients at risk of death or permanent disability.

MRSA infections are often more lethal than those susceptible to methicillin (three times more in some studies).¹⁴⁰ During 2005 in U.S. hospitals, one in 20 patients treated for MRSA (5%) died – many were elderly or had other risk factors.

A number of factors place people at risk for MRSA infection including:

- health care providers failing to wash their hands
- recontamination of clean hands after contact with contaminated gowns or clothing
- admission to an intensive care unit (ICU), dialysis unit or burn unit
- extended stay in an acute care facility
- previous or recurrent hospitalizations
- invasive procedures
- proximity to an MRSA patient

MRSA is treated with more toxic antibiotics such as vancomycin; this toxicity can lead to renal failure. From a clinical perspective, the increase in both MRSA and the use of vancomycin could create a new set of patients requiring kidney dialysis and left with a poorer quality of life. From an epidemiological perspective, the health system's inability to stop this agent's spread shows that hand hygiene practices, cleaning and/or disinfection of



patient-care equipment and contact precautions are not fully implemented. Equally troubling, more resistant mutations of the same bacteria could lead to new outbreaks and more deaths. Documented cases of mutations with more resistant strains of MRSA exist in the literature and are shown to cause higher mortality.¹⁴¹

The Netherlands, Iceland, Denmark, Sweden and Finland have employed active surveillance and comprehensive MRSA prevention regimes and have the highest success minimizing or eliminating MRSA in the world. Key features of the very successful Netherlands "Search and Destroy" strategy at the hospital level include:^{142, 143, 144}

- All professional staff are screened and must be clear of MRSA infection to care for patients.
- All patients are screened and if they are found to be positive for MRSA infection, are treated before elective admission. All their contacts are traced in the community, screened and treated until negative.
- All patients that have been hospitalized in foreign countries, patients that are emergency admissions and patients that are transferred from organizations known to have antibiotic resistant organisms are automatically placed in isolation procedures at the point of entry, screened and remain so until cleared of infection or colonization. All their contacts are traced in the community, screened and treated until negative.
- All cases of MRSA, VRE or *C. difficile* must be reported to the national surveillance system.

The cost of the Netherlands' policy is high but cost effective due to its contribution to lower overall treatment costs for *Staphylococcus aureus* infections.¹⁴⁵

In 2006, 48 sentinel hospitals from nine Canadian provinces participated in the Canadian Nosocomial Infection Surveillance Project and submitted data on newly identified MRSA cases for hospitalized patients.¹⁴⁶

There was a total of 5,787 newly identified MRSA cases during the surveillance with these results:

- 3,561 (62%) cases were acquired in the sentinel hospitals.
- 377 (7%) cases were associated with other acute care hospitals.
- 452 (8%) cases were associated with care in long term care facilities.
- 893 (15%) cases were acquired in the community.
- 404 (7%) did not have the source determined.

In 2008, Alberta Health and Wellness released a Standard for Prevention and Management of MRSA.¹⁴⁷ The Safer Healthcare Now! campaign (SHN) also released its Getting Started Kit MRSA.¹⁴⁸ In Alberta, surveillance data is being collected only on the number of clinical isolates identified at provincial laboratories.

Indicator Definition

Numerator: Number of patients diagnosed with health care associated MRSA.

Denominator: Total number of patient days by hospital.

What the Data Shows

There are 115 acute care facilities in Alberta and very few are targeting MRSA as a priority. As of October 2008, the SHN campaign had five Alberta teams involved in its collaborative efforts. Currently there is no data available on the incidence of health care associated infections by MRSA in Alberta.

Examples of Actions for Improvement

The SHN campaign proposes the following procedures for MRSA prevention:

- Each patient area meets the three standards for the alcohol-based hand hygiene bundle:
 - dispenser is easily visible and accessible
 - easy to mechanically activate with adequate volume of product in the dispenser
 - two sizes of clean gloves are available and accessible at the point of care

- Direct observations are made randomly throughout the month to measure compliance by health care workers with all components of appropriate hand hygiene and glove practice according to the policy in place.
- Time from hospital admission to placement on contact precautions for patients with known or probable MRSA colonization or infection is recorded.
- Time since notification by the laboratory of a MRSA positive patient to placement on contact precautions is recorded.



The SHN campaign proposes the following measures for MRSA surveillance:

- Number of MRSA colonization for 1,000 admissions, assuming universal screening at moment of admission (identification of asymptomatic carriers).
- Number of MRSA hospital infection per 1,000 patient days (identification of symptomatic carriers).

For facilities without an active surveillance program of hospital-acquired infectious diseases, a proxy of MRSA infection involves using clinical isolates instead of cases. Clinical isolates are based on results from microbiology laboratories and offer a pragmatic way of aggregating data from all hospital departments.

In October 2008, the Western Node of the SHN campaign held the first meeting of the MRSA collaborative. Specific interventions in front-line care are in the planning stages. It is possible to eradicate antibiotic resistant organisms in one service; however, to maintain the eradication is an ongoing activity as patients circulate in many health care settings, carrying these organisms from one place to another. It is expected that more teams in action in all health care settings can bring this issue under control.

Discussion

Science identified the role that hand washing plays in the interruption of hospital infection transmission more than 150 years ago. Yet it is still a struggle to ensure that this preventive measure is consistently applied by all health workers in all health care settings. Patients must be empowered to be vigilant in this regard. Patients and their families should be advised to ask health care providers to wash their hands in their presence, or on admission, each patient should receive alcohol gel for their use and the use of their visitors and care providers.

For most communicable diseases, cases continue to occur despite preventive measures. Infectious diseases persist largely due to changes in the characteristics of microbes or in the susceptibility of specific population groups. Preventive measures cannot deliver 100% success in disease elimination. In the case of MRSA or other antibiotic resistant microorganisms, follow up on case incidence, comparison between observed and expected rates and case studies of outbreaks are relevant control measures to avoid the spread of these diseases.¹⁴⁹

Alberta's current MRSA surveillance based on clinical isolates is valuable if combined with an active surveillance system at the departmental level, which allows identification of outbreaks and monitoring of preventive measures.

Should a new strain of an antibiotic resistant organism cause an outbreak, it will be necessary to establish hospital isolation units, treat all colonized patients and staff to eradicate carriage and screen all potentially exposed patients upon discharge. In the current environment of bed shortages, high service volumes and lack of control of antibiotic resistant organisms, such measures would stress the system to its limits. This disastrous situation may occur if this issue is not taken more seriously now.

3.0 Achieving a Balance



Health care is in the midst of a paradigm shift that expands the responsibility for quality from professional competency alone towards professional competency supported by evidence-based practice, systems thinking, measurement and continuous quality improvement. The conclusions presented here are offered to stimulate dialogue on how this shift can best be facilitated.

This report has measured health care from the health system and quality improvement perspectives. As these perspectives converge, it is vital to achieve a balance between clinically specific, actionable bottom-up indicators that meet local program needs, and system-standardized indicators that are comparable on multiple levels and can be aggregated to reflect health system and program performance.

This is a daunting task. But unless the journey begins, Albertans will never know the value they get for their health care tax dollars and it will be difficult to choose the best processes of care or to systematically improve the care that Albertans receive.

Integrate Data Systems and Measurement

Data systems and measurement are moving towards greater integration but must advance further. Such information should be integrated for the purpose of better care, quality monitoring and quality improvement. Electronic health records, electronic medical records and disease registries could, in due course, provide an efficient means of both integrating and capturing relevant quality information for specific conditions. Ultimately, a patient's health care information should be vertically and horizontally integrated with the flexibility to collect relevant and standardized data sets for care of a multitude of specific conditions.

Empower Innovation

The health care industry with its multitude of services, locations, care providers, professionals, processes, procedures, treatments and technologies, as well as variable and changing evidence for best practice, must all come together effectively with the patient at the centre to achieve the best possible outcomes in the most efficient way. Innovations in care delivery and the freedom to innovate are critical to moving this goal forward. Innovation should be empowered from the bottom up, but within a framework of evidence, rigorous evaluation and measurement. Innovations must be measured and proven so they can be adopted or adapted elsewhere.

As Section 2.0 illustrates, what needs to be done is often already known and innovations are underway in pockets of excellence in Alberta or elsewhere. These are only a sampling of numerous success stories, more of which will be reported in the next edition. The potential benefit of broadly expanding these successes is large. Such innovation must be nurtured and evaluated so success spreads beyond isolated pockets across the health system.

Dedicate Resources to Evaluation, Measurement and Quality Improvement

Evaluation, measurement, and quality improvement activities require dedicated resources and adequate professional training. Often measurement efforts are done without professional training by committed staff on top of an already excessive workload, or as an after thought to meet accountability or budget requirements. Investment, support, and education are required to ensure value for the substantial health care expenditures.

Give Priority to More Effective Chronic Disease Management and Control

More effective control and management of chronic disease is an absolute priority. While this may help reduce net health care expenditures and improve efficiency over time, it is the right thing to do from the perspective of accountability to Alberta's citizens and patients.

Managing chronic disease effectively shifts focus from acute care to community care (a more appropriate care setting), and towards an active partnership between patients and providers. It requires greater engagement of patients in managing their own care but also more accountability for providers in supporting these patients. Quality of life, function, and productivity for many citizens is at stake.

Preventing the need for intensive health care services through better health management and support at the community level may help to reduce net health care expenditures in the medium term. Better care and management of chronic disease will cost money and may result in a healthier but older population. The long-term impact of this on health expenditures is unknown.

Capture Costs at the Patient Level

The solution to the issue of sustainability is to face it head on. Alberta needs to capture cost data at the patient level and link costs, activity and outcomes. This is the only way Albertans will know what value they are getting for their expenditure. New technologies may add substantial costs to health care, but could be evaluated more rigorously and systematically for relative cost versus benefit at the patient level.

Routinely Measure Outcomes

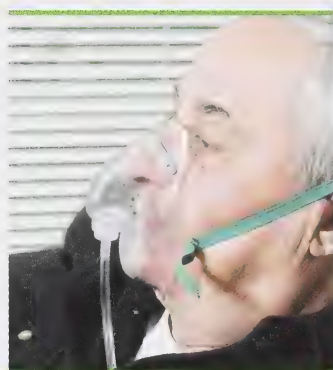
Outcomes need to be systematically and routinely measured. Along with measures of quality that are specific to particular health care needs (diseases), it would be useful to establish a generic outcome measure within the electronic health records of Albertans. Reliable health-related quality of life measures have been developed and are available in the public domain (EQ-5D for example). If such measures were routinely captured, it would be possible for outcomes to be tracked and compared for both similar and diverse health care interventions. EQ-5D in particular supports analysis of relative value versus expenditure as cost per quality-adjusted life year gained (QALY). These methods have been routinely employed in health technology assessment by the NICE in the U.K., and could be applied more generally if health-related quality of life information was systematically captured.

Develop Measurement Infrastructure

To assess and maximize the value of health expenditure to Albertans and the quality of care they receive, more robust patient-level cost information must be tied to specific measures of the care process, quality of care and outcome. A measurement infrastructure – including plans, resources, roles and responsibilities – must be instituted that defines what common measures are important, and how these can be established and supported to link inputs to processes and outcomes.

Disseminate and Use the *Alberta Quality Matrix for Health Framework*

The *Alberta Quality Matrix for Health* framework acts as a lens through which the health care system can be viewed as illustrated in this report. The power of disseminating and using the matrix is that it provides a common language, understanding and approach to quality for health system users, policy-makers, providers and organizations.



Managing chronic disease effectively shifts focus from acute care to community care, and towards an active partnership between the patient and the providers.

Acknowledgements

The Health Quality Council of Alberta gratefully acknowledges the following organizations and individuals for their contributions to this report. This report would not have been possible had these organizations and individuals not been willing to share their experiences and the results of their improvement efforts. No one individual was involved in all parts of this project and, therefore, did not provide their perspective on all aspects of the report.

Dr. George Alvarez – Alberta Health Services (Calgary Health Region)
 Dr. Peggy Aufricht – Crowfoot Village Family Practice
 Nancy Bott – Alberta Perinatal Health Program
 Dr. Tom Briggs – Alberta Health Services (Calgary Health Region)
 Ashley Carlson – Caritas Health Group
 Susan Carriere – Alberta Health Services (Chinook Health Region)
 Quennie Choo – Alberta Health Services (Capital Health)
 Dr. Sandra Delon – Alberta Health Services (Calgary Health Region)
 Dr. Peter Faris – Alberta Bone & Joint Health Institute
 Dr. Ward Flemons – Alberta Health Services (Calgary Health Region)
 Grant Frame – Alberta Health Services (Capital Health)
 Corine Frick – Alberta Perinatal Health Program
 Gary Gilham – Alberta Health and Wellness
 Trudy Harbidge – Alberta Health Services (Chinook Health Region)
 Dr. Elizabeth Henderson – Alberta Health Services (Calgary Health Region)
 Gail Hufty – Alberta Health Services (Capital Health)
 Dr. Grant Innes – University of Calgary
 Cheryl Knight – Alberta Health Services (Chinook Health Region)
 Jason Knox – Alberta Health Services (Calgary Health Region)
 Susan Kristensen – Alberta Health Services (Chinook Health Region)
 Debra Lundberg – Alberta Health Services (Calgary Health Region)
 Dr. Judy MacDonald – Alberta Health Services (Calgary Health Region)
 Blair MacKinnon – Alberta Health and Wellness
 Dr. Braden Manns – Alberta Health Services (Calgary Health Region)
 Dr. Paule Poulin – Alberta Health Services (Calgary Health Region)
 Penney Richey – Alberta Health Services (David Thompson Health Region)
 Tanis Rollefstad – Safer Healthcare Now!
 Dr. Brian H. Rowe – University of Alberta
 Dr. Adelia Santos – Rumel Santos Health Care Training and Consulting
 Reza Shahpori – Alberta Health Services (Calgary Health Region)
 Donna Stelmachovich – Alberta Health Services (Chinook Health Region)
 Dr. Mouhieddin Traboulsi – Alberta Health Services (Calgary Health Region)
 Marlies Van Dijk – Safer Healthcare Now!
 Dan Woods – Alberta Health Services (David Thompson Health Region)
 Dr. Huiming Yang – Alberta Cancer Board
 Sharon Zhang – Alberta Perinatal Health Program

List of Figures

- Figure 1:** Inflation adjusted public health expenditures in Alberta
- Figure 2:** Age-weighting curve for Alberta
- Figure 3:** Provincial inflation adjusted public health expenditure per age-weighted capita
- Figure 4:** Per cent of respondents satisfied or very satisfied with the health care services they received in the previous year
- Figure 5:** Respondents' ratings of difficulty or ease accessing needed health care services in the previous year
- Figure 6:** Per cent of Albertans (or immediate family member) experiencing unexpected harm while receiving health care in Alberta in the past year
- Figure 7:** First cataract surgery: Distribution of surgeons by the time 50% of their patients were completed (Calgary Health Region, August 31, 2008)
- Figure 8:** First cataract surgery: Distribution of surgeons by the time 50% of their patients were completed (Capital Health, August 31, 2008)
- Figure 9:** Knee replacement surgery: Distribution of surgeons by the time 50% of their patients were completed (Calgary Health Region, August 31, 2008)
- Figure 10:** Knee replacement surgery: Distribution of surgeons by the time 50% of their patients were completed (Capital Health, August 31, 2008)
- Figure 11:** Emergency department median length of stay (LOS): Patients presenting with cellulitis/septicemia and admitted with a necrotizing fasciitis diagnosis (2004/05 – 2006/07)
- Figure 12:** Emergency department length of stay (LOS): Patients presenting with abdominal pain and admitted for appendectomy (2006/07 – higher volume sites only)
- Figure 13:** Crowfoot Village Family Practice model under patient-based funding
- Figure 14:** Emergency visits for upper respiratory tract infection among Crowfoot clinic patients compared with Calgary Health Region residents (1997/98 – 2001/02)
- Figure 15:** 30 day in-hospital heart attack mortality rate in Alberta by health region (2004/05 – 2006/07)
- Figure 16:** Proportion of diabetes patients with blood glucose controlled at baseline and 12 months later for each cohort of enrolled patients for each quarter of a year in the Calgary Health Region Chronic Disease Management Program
- Figure 17:** Proportion of diabetes patients with previous emergency department visits at baseline and 12 months later for each cohort of enrolled patients for each quarter of a year in the Calgary Health Region Chronic Disease Management Program

- Figure 18:** Prevalence of falls and incidence of fractures by long term care site (Chinook Health Region, 2008)
- Figure 19:** Neonatal mortality: Babies between 1,000 and 2,499 grams (Alberta, 1983 – 2006)
- Figure 20:** Perinatal mortality: Babies between 1,000 and 2,499 grams (Alberta, 1998 – 2006)
- Figure 21:** Compliance with VAP bundle (October 2005 to June 2008; eight Alberta teams/seven organizations)
- Figure 22:** Infection rate of ventilator-associated pneumonia (Rockyview General Hospital ICU, 2004 – 2007)
- Figure 23:** Surgical site infection: Proportion of patients receiving timely antibiotic (October 2005 to December 2007; 12 Alberta teams/seven organizations)

List of Tables

- Table 1:** Prospective 2006/07 direct costs by population classification in 2005/06
- Table 2:** Average prospective per person utilization (2006/07)
- Table 3:** Average prospective per person direct costs (2006/07)
- Table 4:** Alberta average utilization for four specific diabetes CRGs (2006/07)
- Table 5:** Three-year transition rate from diabetes alone to other risk groups
- Table 6:** Albertans' satisfaction with emergency department services (2003-2008)
- Table 7:** Albertans' overall rating of emergency department care received (2007)
- Table 8:** Median wait time for selected elective surgeries by Alberta health region and selected surgeons (August 31, 2008)
- Table 9:** Proportion of ED/urgent care visits for conditions that could be managed at family physician offices by Alberta health region (2006/07)
- Table 10:** Visits by Crowfoot family practice roster patients (2006/07) (actual versus expected)
- Table 11:** Proportion of seniors with high-level service utilization for conditions that could be managed in the community by Alberta health region (2006/07)
- Table 12:** Cost-effectiveness of activated protein C for sepsis patients in Calgary Health Region intensive care units (2001)
- Table 13:** Estimate of Albertans with coronary artery disease and diabetes receiving suboptimal care (March 2007)
- Table 14:** Annual estimate of preventable complications related to chronic disease by use of recommended management interventions in Alberta (2006/07)

Glossary

Age-weighted population – An age-adjusted rate is a weighted average of the age-specific (crude) rates, where the weights are the proportions of persons in the corresponding age groups of a standard population. The potential confounding effect of age is reduced when comparing age-adjusted rates computed using the same standard population.

Apache II – Acute Physiology and Chronic Health Evaluation II is a severity of disease classification system (Knaus et al., 1985), one of several intensive care unit scoring systems developed for adults.

Best practices – Best practices can be defined as the most efficient (least amount of effort) and effective (best results) way of accomplishing a task, based on repeatable procedures that have proven themselves over time for large numbers of people.

Cardiac or coronary catheterization – Cardiac catheterization (also called heart catheterization) is a diagnostic and occasionally therapeutic procedure that allows a comprehensive examination of the heart and surrounding blood vessels. It enables the physician to take angiograms, record blood flow, calculate cardiac output and vascular resistance, perform an endomyocardial biopsy, and evaluate the heart's electrical activity. Cardiac catheterization is performed by inserting one or more catheters (thin flexible tubes) through a peripheral blood vessel in the arm (antecubital artery or vein) or leg (femoral artery or vein) under x-ray guidance.

3M™ Clinical Risk Grouping (CRG) Software – Using demographic data, diagnosis codes and procedure codes, 3M™ Clinical Risk Grouping (CRG) Software helps identify and classify patients into clinically meaningful groups for risk adjustment. CRGs relate the historical clinical and demographic characteristics of an individual to the amount and type of health care resources that an individual will consume in the future.

Electrocardiogram – A recording of the electrical activity of the heart. An electrocardiogram (ECG) is a simple, non-invasive procedure. Electrodes are placed on the skin of the chest and connected in a specific order to a machine that, when turned on, measures electrical activity around the heart. For example, the initial diagnosis of a heart attack is usually made by a combination of clinical symptoms and characteristic ECG changes. The ECG can detect areas of muscle ischemia (muscle deprived of oxygen) and/or dead tissue in the heart.

Electronic health record – An electronic health record (EHR) refers to an individual patient's health record in digital format. Electronic health record systems integrate and retrieve individual patient medical records within a computer system. It may comprise individual electronic medical records (EMRs) from many locations and/or health service providers (e.g., patient demographics, encounters, diagnosis, treatments, diagnostic imaging, laboratory and medication information) and is accessible by authorized health care providers from various locations.

Electronic medical record – An electronic medical record (EMR) is a local medical record in digital format. For example, a family physician practice may have an EMR for each patient; this information is stored locally and is not directly accessible to other health care providers.

Fibrinolytic drugs – Fibrinolytic drugs are given after a heart attack to dissolve the thrombus blocking the coronary artery, experimentally in stroke to reperfuse the affected part of the brain, and in massive pulmonary embolism. The process is called thrombolysis.

Median wait time – Median wait time was calculated by sorting the list of waiting patients from the shortest to longest wait times. This sorted distribution was then split in half, with the median the value that divided the first 50% of the population from the second.

Morbidity – Refers to a disease state, disability or poor health due to any cause. The term may be used to refer to the existence of any form of disease, or to the degree that the health condition affects the patient.

Neonatal mortality – Deaths under the age of 28 days.

Percutaneous coronary intervention (PCI) – PCI, commonly known as coronary angioplasty or simply angioplasty, is a therapeutic procedure to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease. These stenotic segments are due to the build up of cholesterol-laden plaques that form due to atherosclerosis. PCI is usually performed by an interventional cardiologist. The term balloon angioplasty is commonly used to describe PCI, which describes the inflation of a balloon within the coronary artery to crush plaque into the walls of the artery.

Perfusion – The act of pouring over or through, especially the passage of a fluid through the vessels of a specific organ.

Perinatal mortality – Still births and deaths in the first seven days of life.

QALY – The quality-adjusted life year is a measure of disease burden, including both the quality and the quantity of life lived. It is used in assessing the value for money of a medical intervention. The QALY is based on the number of years of life that would be added by the intervention. Each year in perfect health is assigned the value of 1.0 down to a value of 0.0 for death. If the additional years were not lived in full health, for example, loss of limb, blindness or confinement to a wheelchair, the extra life years are given a value between 0 and 1 to account for this.

Reperfusion – The restoration of blood flow to an organ or tissue. After a heart attack, the immediate goal is to open blocked arteries and reperfuse the heart muscles. Early reperfusion minimizes the extent of heart muscle damage and preserves the pumping function of the heart.

STEMI – Segment elevation myocardial infarction or STEMI is a type of myocardial infarction; myocardial infarction is commonly known as a heart attack. Most cases of STEMI are treated with thrombolysis or if possible with percutaneous coronary intervention (PCI, angioplasty and stent insertion).

References

- ¹ Canadian Institute for Health Information, National Health Expenditure Trends 1975-2008, November 13, 2008.
- ² C.E. Adair, et al., Performance Measurement Systems in Health and Mental Health Services: Models, Practices and Effectiveness, The Alberta Heritage Foundation for Medical Research, January 2003.
- ³ Health Quality Network, *Alberta Quality Matrix for Health* User Guide, Health Quality Council of Alberta, 2005.
- ⁴ L.A. Martin, E.C. Nelson, R.C. Lloyd, T.W. Nolan, "Whole System Measures," IHI Innovation Series white paper, Cambridge, Massachusetts: Institute for Healthcare Improvement, 2007.
- ⁵ J.S. Hughes, R.F. Averill, J. Eisenhandler, N.I. Goldfield, J. Muldoon, J.M. Neff, J.C. Gay, "Clinical Risk Groups (CRGs): A Classification System for Risk Adjusted Capitation-Based Payment and Health Care Management," *Medical Care* 2004, 42:1, 81-90.
- ⁶ S.R. Dean, Using Clinical Risk Groups to Develop a Planning Model for Regional Health Systems, Department of Community Health Science, University of Calgary 2007, PhD Thesis.
- ⁷ Health Quality Council of Alberta, Satisfaction with Health Care Services: A Survey of Albertans, 2008.
- ⁸ World Alliance for Patient Safety, WHO Draft Guidelines for Adverse Event Reporting and Learning Systems: From Information to Action, World Health Organization, 2005.
- ⁹ Health Quality Network, *Alberta Quality Matrix for Health* User Guide, Health Quality Council of Alberta, 2005.
- ¹⁰ Health Quality Council of Alberta, Satisfaction with Health Care Services: A Survey of Albertans, July 2006.
- ¹¹ Health Quality Council of Alberta, Emergency Department Patient Experience Survey – Section A: Provincial Results, 2008.
- ¹² B.R. Holroyd, M.J. Bullard, K. Latoszek, et al., "Impact of a Triage Liaison Physician on Emergency Department Overcrowding and Throughput: A Randomized Controlled Trial," *Academic Emergency Medicine* 2007, 14:702-8.
- ¹³ M.A. Stewart, "What is a Successful Doctor-Patient Interview? A Study of Interactions and Outcomes," *Soc Sci Med* 1994, 19:2, 167-175.
- ¹⁴ J. Bensing, "Doctor-Patient Communication and The Quality of Care," *Soc Sci Med* 1991, 32:11, 1302-1310.
- ¹⁵ M.A. Stewart, "Effective Physician-Patient Communication and Health Outcomes: A Review," *Canadian Medical Association Journal* 1995, 152:9, 1423-1433.

- 16 S.R. Weingarten et al., "A Study of Patient Satisfaction and Adherence to Preventive Care Practice Guidelines," *American Journal of Medicine* 1995, 99: 590–596.
- 17 R.D. Adelman, M.G. Greene, M.G. Ory, "Communication between Older Patients and Their Physicians," *Clinics in Geriatric Medicine* 2000, 16:1, 1–24.
- 18 M.A. Stewart, L. Meredith, J.B. Brown, J. Galajda, "The Influence of Older Patient-Physician Communication on Health and Health-Related Outcomes," *Clinics in Geriatric Medicine* 2000: 16:1, 25–36.
- 19 Z.D. Blasi, E. Harkness, E. Ernst, A. Georgiou, J. Kleijnen, "Influence of Context Effects on Health Outcomes: A Systematic Review," *The Lancet* 2001, 357: 757–762.
- 20 C.M. Meade, J. Kennedy, J. Kaplan, "The Effects of Emergency Department Staff Rounding on Patient Safety and Satisfaction," *The Journal of Emergency Medicine* 2008, (In Press).
- 21 S. Derrett, C. Paul, J.M. Morris, "Waiting for Elective Surgery: Effects on Health-Related Quality of Life," *Int J Qual Health Care* 1999, 11:47–57.
- 22 B. Postl, Final Report of the Federal Advisor on Wait Times – June 2006.
- 23 Alberta Health and Wellness, Alberta Waitlist Registry, www.ahw.gov.ab.ca/waitlist 2008.
- 24 Canadian Medical Association and Wait Time Alliance for Timely Access to Health Care, No more time to wait: Toward benchmarks and best practices in wait time management 2005.
- 25 Alberta Bone & Joint Health Institute, Alberta Hip & Knee Replacement Project: Scientific Evaluation Report 2007.
- 26 T. Noseworthy, Improving Management of Waiting Times in Western Canada 2004.
- 27 Ibid.
- 28 Health Council of Canada, Fixing the Foundation: An Update on Primary Health Care and Home Care Renewal in Canada 2008.
- 29 P. Glynn, Saskatchewan Surgical Care Network 2004.
- 30 Alberta Bone & Joint Health Institute, Alberta Hip & Knee Replacement Project: Scientific Evaluation Report 2007.
- 31 Canadian Institute for Health Information, Understanding Emergency Department Wait Times: Who is Using Emergency Departments and How Long Are They Waiting? 2005.
- 32 Health Quality Council of Alberta, Review of Emergency and Urgent Care Services in the Calgary Health Region – Supplementary Report 2008.

- 33 M.J. Schull, M. Vermeulen, G. Slaughter, L. Morrison, P. Daly, "Emergency Department Crowding and Thrombolysis Delays in Acute Myocardial Infarction," *Annals of Emergency Medicine* 2004, 44: 577–85.
- 34 American College of Emergency Physicians Task Force Report on Boarding, Emergency Department Crowding: High Impact Solutions 2008.
- 35 M.J. Bullard, B. Unger, J. Spence, E. Grafstein, CTAS National Working Group, "Revisions to the Canadian Emergency Department Triage and Acuity Scale (CTAS) Adult Guidelines," *Canadian Journal of Emergency Medicine* 2008, 10: 136–42.
- 36 R. Beveridge, B. Clarke, L. Janes, et al., "Canadian Emergency Department Triage and Acuity Scales: Implementation Guidelines," *Canadian Journal of Emergency Medicine* 1999, 1 (suppl): S1–S27.
- 37 D. Choi, M. Bullard, B.R. Holroyd, D. Meurer, B.H. Rowe, "The Effect of a Clinical Practice Guideline on the Management of Cellulitis in the Emergency Department," *Canadian Journal of Emergency Medicine* 2004, 6: Scientific Abstract 080.
- 38 B.H. Rowe, A.M. Chahal, C.H. Spooner, S. Blitz, A. Senthilselvan, D. Wilson et al., "Increasing the Use of Anti-inflammatory Agents for Acute Asthma in the Emergency Department: Experience with an Asthma Care Map," *Canadian Respiratory Journal* 2008, 15: 20–6.
- 39 D. Mackey, M. Myles, C.H. Spooner, H. Lari, L. Tyler, S. Blitz et al., "Changing the Process of Care and Practice in Acute Asthma in the Emergency Department: Experience with an Asthma Care Map in a Regional Hospital," *Canadian Journal of Emergency Medicine* 2007, 9: 353–65.
- 40 M. Jones, "Walk-in Primary Medical Care Centres: Lessons from Canada," *British Medical Journal* 2000, 321: 928–31.
- 41 J. Barnsley, A.P. Williams, J. Kaczorowski, E. Vayda, E. Vingilis, A. Campbell et al., "Who Provides Walk-in Services? Survey of Primary Care Practices in Ontario," *Canadian Family Physician* 2002, 48: 519–26.
- 42 D. Behroozi, R.H. Brown, "What is the Role of Walk-in Clinics?" *Canadian Family Physician* 2002, 48: 875–6.
- 43 D. Jones, "B.C. Walk-in Clinics Warned," *Canadian Medical Association Journal* 2006, 1512.
- 44 College of Physicians & Surgeons of Alberta, Complaint Issue: One Problem Per Visit, *The Messenger*, May 2006.
- 45 Statistics Canada, Canadian Institute for Health Information – Health Indicators 2007.
- 46 P. Aufricht, The Crowfoot Experience: Crowfoot Village Family Practice Primary Care Health Reform Pilot Project, Final Report, April 2003.

- 47 Primary Care Initiative: www.albertapci.ca/Pages/default.aspx, 2008.
- 48 Health Canada, Division of Aging and Seniors, Canada's Aging Population, 2002.
- 49 D. Irfan, "Canada's Health Care System and the Sustainability Paradox," *Canadian Medical Association Journal* 2007, 177: 51–3.
- 50 H. Bergman, F. Beland, P. Lebel, A.P. Contandriopoulos, P. Tousignant, Y. Brunelle et al., "Care for Canada's Frail Elderly Population: Fragmentation or Integration?" *Canadian Medical Association Journal* 1997, 157: 1116–21.
- 51 T. Bodenheimer, "Long Term Care for Frail People – the On Lok Model," *New England Journal of Medicine* 1999, 341: 1324–8.
- 52 P. Chatterjee, N.R. Bustein, D. Kidder et al., Program of all-inclusive care for the elderly (PACE), U.S., 2007.
- 53 I. Philp, A Recipe for Care-Not a Single Ingredient, U.K. Department of Health 2007.
- 54 Y. Robitaille, S. Laforest, M. Fournier, L. Gauvin, M. Parisien, H. Corriveau et al., "Moving Forward in Fall Prevention: An Intervention to Improve Balance Among Older Adults in Real-World Settings," *Am J Public Health* 2005, 95: 2049–56.
- 55 R. McClure, C. Turner, N. Peel, A. Spinks, E. Eakin, K. Hughes, Population-based Interventions for the Prevention of Fall-related Injuries in Older People, Cochrane Database of Systematic Reviews, 3, 2008.
- 56 J. Pynoos, D. Rose, L. Rubenstein, I.H. Choi, D. Sabata, "Evidence-Based Interventions in Fall Prevention," *Home Health Care Services Quarterly* 2006, 25: 55–73.
- 57 L.Z. Rubenstein, A.S. Robins, K.R. Josephson, B.L. Schulman, D. Osterwei, "The Value of Assessing Falls in an Elderly Population," *Ann Intern Med* 2008, 113: 308–16.
- 58 M.E. Tinetti, "Multifactorial Fall-Prevention Strategies: Time to Retreat or Advance," *Journal of the American Geriatrics Society* 2008, 56: 1563–5.
- 59 S. Gates, S.E. Lamb, J.D. Fisher, M.W. Cooke, Y.H. Carter, "Multifactorial Assessment and Targeted Intervention for Preventing Falls and Injuries among Older People in Community and Emergency Care Settings: Systematic Review and Meta-analysis," *British Medical Journal* 2008, 336: 130–3.
- 60 U.K. Department of Health and Urgent Care Pathway Group, Urgent Care Pathways for Older People with Complex Needs: Best Practice Guidance 2007.
- 61 E. Grunfeld, R. Glossop, I. McDowell, C. Danbrook, "Caring for Elderly People at Home: The Consequences to Caregivers," *Canadian Medical Association Journal* 1997, 157: 1101–5.

- 62 J.E. Gaugler, S.E. Jarrott, S.H. Zarit, M.A.P. Stephens, A. Townsend, R. Greene, "Respite for Dementia Caregivers: The Effects of Adult Day Service Use on Caregiving Hours and Care Demands," *International Psychogeriatrics* 2003, 15: 37–58.
- 63 A. Andersson, L.A. Levin, B.G. Emtinger, "The Economic Burden of Informal Care," *International Journal of Technology Assessment in Health Care* 2002, 18: 46–54.
- 64 Y. Carriere, A. Belanger, S. Lafreniere, Dependent Seniors at Home – Formal and Informal Help, Health Reports 2003, 14: 31.
- 65 Division of Aging and Seniors, Health Canada, Principles of the National Framework on Aging: A Policy Guide 1998.
- 66 Audit Commission, Older People – Independence and Well-being: The Challenge for Public Services, U.K., 2004.
- 67 J. Langan, R. Means, and S. Rolfe, Maintaining Independence in Later Life: Older People Speaking 1996, Anchor Trust.
- 68 N. Raynes, H. Clark, J. Beecham and eds., The Report of the Older People's Inquiry into 'That Bit of Help' 2005, Joseph Rowntree Foundation.
- 69 Alberta Health Services – Capital Health Community Care Services, CHOICE: www.capitalhealth.ca/ProgramsAndServices.
- 70 Alberta Health Services – Capital Health Community Care Services, Seniors Housing Guide 2008.
- 71 National Institute for Health and Clinical Excellence, Briefing Paper for the Methods Working Party on the Cost-effectiveness Threshold 2007.
- 72 D.C. Angus, W.T. Linde-Zwirble, J. Lidicker, G. Clemont, J. Carcillo, M.R. Pinsky, "Epidemiology of severe sepsis in the United States: Analysis of incidence, outcome, and associated costs of care," *Crit Care Med*, 2001, Jul. 29:7, 1303–10.
- 73 G.R. Bernard, J.L. Vincent, P.F. Laterre, S.P. LaRosa et al., "Efficacy and Safety of Recombinant Human Activated Protein C for Severe Sepsis," *New England Journal of Medicine* 2001, 344: 699–709.
- 74 B.J. Manns, H. Lee, C.J. Doig, D. Johnson, C. Donaldson, "An Economic Evaluation of Activated Protein C Treatment for Severe Sepsis," *New England Journal of Medicine* 2002, 347: 993–1000.
- 75 National Institute for Health and Clinical Excellence, Guide to the Methods of Technology Appraisal 2008.
- 76 U. Stenestrand, J. Lindback, L. Wallentin, for the RIKS-HIA Registry, "Long-term Outcome of Primary Percutaneous Coronary Intervention vs Prehospital and In-Hospital Thrombolysis for Patients With ST-Elevation Myocardial Infarction," *Journal of the American Medical Association* 2006, 296: 1749–56.

- 77 R.H. Mehta, C.K. Montoye, M. Gallogly, P. Baker, A. Blount, J. Faul et al., "Improving Quality of Care for Acute Myocardial Infarction: The Guidelines Applied in Practice (GAP) Initiative," *Journal of the American Medical Association* 2002, 287: 1269–76.
- 78 B.T.B. Chan et al., Improving the Quality of Heart Attack Care in Saskatchewan: Outcomes and Secondary Prevention, Health Quality Council of Saskatchewan 2004.
- 79 H.V. Barron, A.D. Michaels, C. Maynard, N.R. Every, "Use of Angiotensin Converting Enzyme Inhibitors at Discharge in Patients with Acute Myocardial Infarction in the United States: Data from the National Registry of Myocardial Infarction," *Journal of the American College of Cardiology* 1998, 32: 360–7.
- 80 I.A. Scott, A.B. Duke, I.C. Darwin, K.H. Harvey, M.A. Jones, for the CHI Cardiac Collaborative, "Variations in Indicated Care of Patients with Acute Coronary Syndromes in Queensland Hospitals," *Medical Journal of Australia* 2005, 182: 325–30.
- 81 E.M. Antman, D.T. Anbe, P.W. Armstrong, E.R. Bates, L.A. Green, M. Hand et al., "ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction – Executive Summary: A Report of the American College of Cardiology American Heart Association Task Force on Practice Guidelines," *Journal of the American College of Cardiology* 2004, 44: 671–719.
- 82 P.W. Armstrong, P. Bogaty, C.E. Buller, P. Dorian, B.J. O'Neill, "The 2004 ACC/AHA Guidelines: A Perspective and Adaptation for Canada by the Canadian Cardiovascular Society Working Group," *Canadian Journal of Cardiology* 2004, 20: 1075–9.
- 83 H.P. Adams Jr., G. del Zoppo, M.J. Alberts, D.L. Bhatt, L. Brass, A. Furlan et al., "Guidelines for the Early Management of Adults With Ischemic Stroke: A Guideline From the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups," *Circulation* 2007, 115: e478–e534.
- 84 M.R. Le May, D.Y. So, R. Dionne, C.A. Glover, M.P.V. Froeschl, G.A. Wells et al., "A Citywide Protocol for Primary PCI in ST-Segment Elevation Myocardial Infarction," *New England Journal of Medicine* 2008, 358: 231–40.
- 85 A. Travers, "Achieving Optimal Care for ST-Segment Elevation Myocardial Infarction in Canada," *Canadian Medical Association Journal* 2007, 176: 1843–4.
- 86 J.S. de Villiers, T. Anderson, J.D. McMeekin, R.C.M. Leung, M. Traboulsi, for the Foothills Interventional Cardiology Service and the Calgary STEMI QIHI group, "Expedited Transfer for Primary Percutaneous Coronary Intervention: A Program Evaluation," *Canadian Medical Association Journal* 2007, 176: 1833–8.

- 87 Foothills Interventional Cardiology Service, FICS STEMI Follow-up Clinic – Phase A Proposal, 1-16-2007.
- 88 Alberta Cardiac Access Collaborative, Statement of Work for Heart Attack Initiative, 12-7-2007.
- 89 Alberta Cardiac Access Collaborative, Alberta Cardiac Access Collaborative Evaluation Framework – Final Plan 2008.
- 90 Alberta Cardiac Access Collaborative, Alberta Cardiac Access Collaborative – Who We Are 2008.
- 91 I. Street, Alberta Cardiac Access Collaborative – Statement of Work for Heart Failure, 8-13-2008.
- 92 World Health Organization, Preventing Chronic Diseases: A vital investment 2003.
- 93 A.M. Broemeling, D.E. Watson, F. Prebtani, "Population Patterns of Chronic Health Conditions, Comorbidity and Healthcare Use in Canada: Implications for Policy and Practice," *Healthcare Quarterly* 2008, 11: 70–6.
- 94 Toward Optimized Practice: Guidelines for Management of Modifiable Risk Factors in Adults at High Risk for Cardiovascular Events, www.topalbertadoctors.org/cpgs/cardiovascular_events.html.
- 95 D. Yach, C. Hawkes, C.L. Gould, K.J. Hofman, "The Global Burden of Chronic Diseases – Overcoming Impediments to Prevention and Control," *Journal of the American Medical Association* 2004, 291: 2616–22.
- 96 J.E. Epping-Jordan, G. Galea, C. Tukuitoronga, R. Beaglehole, "Preventing chronic diseases: taking stepwise action," *The Lancet* 2005, 366: 1667–71.
- 97 Ontario Health Quality Council, *QMonitor 2008 – Report on Ontario's Health System*.
- 98 CT Lamont Primary Health Care Research Centre, Chapter 3: Chronic Disease Management in Ontario. Technical Report of the 2008 Report on Ontario's Health System – *Qmonitor*, available at www.ohqc.ca/pdfs/technical_report_for_chapter_3_-_sections_3.1_-_3.4.pdf.
- 99 Ontario Health Quality Council, Chapter 3 – Section 3.5: The case for spending to improve chronic disease management. Technical Report of the 2008 Report on Ontario's Health System – *Qmonitor*, available at: www.ohqc.ca/pdfs/technical_report_for_chapter_3_-_section_3.5.pdf.
- 100 Calgary Health Region, Chronic Disease Management, www.calgaryhealthregion.ca/cdm/.
- 101 Ministry of Health, Government of British Columbia, Chronic Disease Management, www.healthservices.gov.bc.ca/cdm/.
- 102 Canadian Health Services Research Foundation, "Turning the Tide on Chronic Disease: How a Province Is Using Evidence to Build Quality Improvement Capacity," *Healthcare Policy* 2007, 3: 67–70.

- 103 Saskatchewan Health Quality Council, Chronic Disease Management Toolkit, www.health.gov.sk.ca/cdm-toolkit.
- 104 The Robert Wood Johnson Foundation, Assessment of Chronic Illness Care Survey, www.ihl.org/IHI/Topics/ChronicConditions/AllConditions/Tools/ACICSurvey.htm.
- 105 interRAI, www.interrai.org/section/view/.
- 106 Alberta Cancer Board, Colorectal Cancer Screening: Fact Sheet for Health Care Providers 2008.
- 107 N. Wadden, "Breast Cancer Screening in Canada: A Review," *Canadian Association of Radiologists Journal* 2005, 56: 271–5.
- 108 Public Health Agency of Canada, Organized Breast Cancer Screening Programs in Canada – Report on Program Performance in 2003 and 2004.
- 109 Alberta Cancer Board, Division of Population Health and Information, Colorectal Cancer Control in Alberta 2007.
- 110 Bowel Cancer Screening Pilot Monitoring and Evaluation Steering Committee, The Australian Bowel Cancer Screening Pilot Program and Beyond: Final Evaluation Report 2005.
- 111 D.C. Hadorn, "Setting priorities for waiting lists: Defining our terms," *Canadian Medical Association Journal* 2000, 163: 857–60.
- 112 National Cancer Institute of Canada, Progress in Cancer Control: Screening, www.cancer.ca, 2006.
- 113 R. Zarychanski, Y. Chen, C.N. Bernstein, P.C. Hebert, "Frequency of Colorectal Cancer Screening and the Impact of Family Physicians on Screening Behaviour," *Canadian Medical Association Journal* 2007, 177: 593–7.
- 114 Alberta Cancer Board, Clinical Practice Guideline: Screening for Colorectal Cancer – new for 2008, 2008.
- 115 B. Levin, D.A. Lieberman, B. McFarland, K.S. Andrews et al., "Screening and Surveillance for the Early Detection of Colorectal Cancer and Adenomatous Polyps, 2008: A Joint Guideline from the American Cancer Society, the U.S. Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology," *Gastroenterology* 2008, 134: 1570–95.
- 116 A.G. Zauber, I. Lansdorp-Vogelaar, A.B. Knudsen, J. Wilschut, M. van Ballegooijen, K.M. Kuntz, "Evaluating Test Strategies for Colorectal Cancer Screening: A Decision Analysis for the U.S. Preventive Services Task Force," *Ann Intern Med* 2008, 149: 659–68.
- 117 J.D. Hardcastle, J.O. Chamberlain, M.H.E. Robinson, S.M. Moss, S.S. Amar, T.W. Balfour et al, "Randomised Controlled Trial of Faecal-Oculta- Blood Screening for Colorectal Cancer," *The Lancet* 1996, 348: 1472–7.

- 118 O. Kronborg, C. Fenger, J. Olsen, O.D. Jorgensen, O. Sondergaard, "Randomised study of screening for colorectal cancer with faecal-occult-blood test," *The Lancet* 1996, 348: 1467–71.
- 119 J.S. Mandel, T.R. Church, J.H. Bond, F. Ederer, M.S. Geisser, S.J. Mongin et al., "The Effect of Fecal Occult-Blood Screening on the Incidence of Colorectal Cancer," *New England Journal of Medicine* 2000, 343: 1603–7.
- 120 J.S. Mandel, T.R. Church, F. Ederer, J.H. Bond, "Colorectal Cancer Mortality: Effectiveness of Biennial Screening for Fecal Occult Blood," *Journal of the National Cancer Institute* 1999, 91: 434–7.
- 121 U.K. Colorectal Cancer Screening Pilot Group, "Results of the First Round of a Demonstration Pilot of Screening for Colorectal Cancer in the United Kingdom," *British Medical Journal* 2004, 329: 133.
- 122 The U.K. CRC Screening Pilot Evaluation Team, Evaluation of the U.K. Colorectal Cancer Screening Pilot – Final Report 2003.
- 123 L. Rabeneck, C. Zwaal, J. Goodman, V. Mai, and M. Zamkane, Guaiac Fecal Occult Blood Testing (FOBT): Evidentiary Base, Cancer Care Ontario – Program in Evidence-Based Care, Draft Evidence-Based Series #15-4: Section 2.
- 124 Alberta Health and Wellness, Alberta Reproductive Health: Pregnancies and Birth. June 2008 revision.
- 125 More^{OB}, www.moreob.com.
- 126 M. Wanke, L. Gardner, P. Jacobs, T. Nguyen, and L. Wozniak, Provincial Evaluation of the MORE^{OB} Program – Interim Report, Alberta Perinatal Health Program.
- 127 P. Dodek, S. Keenan, D. Cook, D. Heyland, M. Jacka, L. Hand et al., "Evidence-Based Clinical Practice Guideline for the Prevention of Ventilator-Associated Pneumonia," *Ann Intern Med* 2004, 141: 305–13.
- 128 American Thoracic Society, Infectious Diseases Society of America, "Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia," *Am J Respir Crit Care Med* 2005, 171: 388–416.
- 129 O.C. Tablan, L.J. Anderson, R. Besser, C. Bridges, and R. Hajjeh, Guidelines for Preventing Health-Care-Associated Pneumonia 2003; Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee.
- 130 Safer Healthcare Now! Getting Started Kit – Prevention of Ventilator-Associated Pneumonia in Adults: How-to Guide 2007.

- 131 M.B. Drakulovic, A. Torres, T.T. Bauer, J.M. Nicolas, S. Nogue, M. Ferrer, "Supine Body Position as a Risk Factor for Nosocomial Pneumonia in Mechanically Ventilated Patients: A Randomised Trial," *The Lancet* 1999, 354: 1851–8.
- 132 C.A. Van Nieuwenhoven, C. Vandenbroucke-Grauls, F.H. van Tiel, H.C.A. Joore, R.J.M.S. van Schiundel, I. van der Tweel et al., "Feasibility and Effects of the Semi-Recumbent Position to Prevent Ventilator-Associated Pneumonia: A Randomized Study," *Critical Care Medicine* 2006, 34: 396–402.
- 133 J.P. Dress, A.S. Pohlman, M.F. O'Connor, J.B. Hall, "Daily Interruption of Sedative Infusions in Critically Ill Patients Undergoing Mechanical Ventilation," *New England Journal of Medicine* 2000, 342: 1471–7.
- 134 W.D. Schweickert, B.K. Gehlbach, A.S. Pohlman, J.B. Hall, J.P. Kress, "Daily Interruption of Sedative Infusions and Complications of Critical Illness in Mechanically Ventilated Patients," *Critical Care Medicine* 2004, 32: 1272–6.
- 135 L. Holzappel, C. Chastang, G. Demingeon, J. Bohe, B. Piralla, A. Coupry, "A Randomized Study Assessing the Systematic Search for Maxillary Sinusitis in Nasotracheally Mechanically Ventilated Patients. Influence of Nosocomial Maxillary Sinusitis on the Occurrence of Ventilator-associated Pneumonia," *Am J Respir Crit Care Med* 1999, 159: 695–701.
- 136 L. Holzappel, S. Chevret, G. Madinier, F. Ohen, G. Demingeon, A. Coupry et al., "Influence of Long-term Oro or Nasotracheal Intubation on Nosocomial Maxillary Sinusitis and Pneumonia: Results of a Prospective Randomized Clinical Trial," *Critical Care Medicine* 1993, 21: 1132–8.
- 137 J.J. Rouby, P. Laurent, M. Gosnach, E. Cambau, G. Lamas, A. Zouaoui et al., "Risk Factors and Clinical Relevance of Nosocomial Maxillary Sinusitis in the Critically Ill," *Am J Respir Crit Care Med* 1994, 150: 776–783.
- 138 A.J. Mangram, T.C. Horan, M.L. Pearson, L.C. Silver, W.R. Jarvis, The Hospital Infection Control Practices Advisory Committee, "Guideline for Prevention of Surgical Site Infection, 1999," *Infection Control and Hospital Epidemiology* 1999, 20: 247–78.
- 139 Centers for Disease Control and Prevention, Healthcare-Associated Methicillin Resistant Staphylococcus aureus (HA-MRSA) 2008, www.cdc.gov/ncidod/dhqp/ar_mrsa.html.
- 140 M.C. Vos, A. Ott, H.A. Verbrugh, W.J.B. Wannet, A.J. de Neeling, "Successful Search-and-Destroy Policy for Methicillin-Resistant Staphylococcus aureus in The Netherlands," *J Clin Microbiol* 2005, 43: 2034–5.

- 141 R.A. Cox, C. Conquest, C. Mallaghan, R.R. Marples, "A Major Outbreak of Methicillin-Resistant *Staphylococcus aureus* Caused by a New Phage-type (EMRSA-16)," *Journal of Hospital Infection* 1995, 29: 87–106.
- 142 M.C. Vos, *The Secrets of MRSA Control in the Netherlands* 2007.
- 143 M.C. Vos, A. Ott, H.A. Verbrugh, W.J.B. Wannet, A.J. de Neeling, "Successful Search-and-Destroy Policy for Methicillin-Resistant *Staphylococcus aureus* in The Netherlands," *J Clin Microbiol* 2005, 43: 2034–5.
- 144 J. Verhoef, D. Beaikeamn, H. Blok, A. Baars, A. Meyler, C. van der Werlem, "A Dutch Approach to Methicillin-Resistant *Staphylococcus aureus*," *European Journal of Clinical Microbiology and Infectious Diseases* 1999, 18: 461–6.
- 145 E. Nulens, E. Broex, A. Ament, R.H. Deurenberg, E. Smeets, J. Scheres et al., "Cost of the Methicillin-Resistant *Staphylococcus aureus* Search and Destroy Policy in a Dutch University Hospital," *Journal of Hospital Infection* 2008, 68: 301–7.
- 146 Canadian Nosocomial Infection Surveillance Program, Surveillance for Methicillin-Resistant *Staphylococcal aureus* (MRSA) – 2006 results.
- 147 Alberta Health and Wellness, Standard for Prevention and Management of MRSA 2008.
- 148 Safer Healthcare Now! Getting Started Kit – MRSA: How-to Guide, 2008.
- 149 D.E. Zoutman, B.D. Ford, Canadian Hospital Epidemiology Committee (CHEC), Canadian Nosocomial Infection Surveillance Program (CNISP), "The Relationship Between Hospital Infection Surveillance and Control Activities and Antibiotic-Resistant Pathogen Rates," *Am J Infect Control* 2005, 33(1):1–5.
- 150 EuroQol Group, www.euroqol.org.

The HQCA acknowledges the contributions of the following staff in the preparation of this report:

Pam Brandt
Norma Brown
Tim Cooke
John Cowell, MD
Stafford Dean, PhD
Charlene McBrien-Morrison
Anette Mikkelsen
Davi Rumel, PhD
Rick Schorn
Dale Wright

ISSN 1920-2156 (Print)
ISSN 1920-2164 (Online)



210, 811 – 14 Street NW Calgary, Alberta T2N 2A4
PH 403.297.8162 info@hqca.ca www.hqca.ca

